# HANDBOOK OF POTENTIAL CONTAMINANTS IN THE AQUATIC ENVIRONMENT

AQUATIC CONTAMINANTS SECTION
WATER RESOURCES BRANCH

# HANDBOOK
# OF
# POTENTIAL CONTAMINANTS
# IN THE
# AQUATIC ENVIRONMENT



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# PREFACE

The "Handbook of Potential Contaminants" is a program undertaken by the Aquatic Contaminants Section of the Water Resources Branch with the aim of providing basic information on a variety of organic and inorganic substances that may be found in the Ontario Environment.

This edition of the Handbook contains, essentially, information on the aquatic component of the Environment. It was prepared by staff of the Water Resources Branch and distributed, at this time to individuals within the Ministry whose responsibilities relate, primarily, to Water Resource Management Issues.

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# POTENTIAL CONTAMINANTS IN THE AQUATIC ENVIRONMENT

## INTRODUCTION

With our increasing concern about the environmental and human health implications of trace pollutants and our laboratory's abilities to identify and quantify these substances in the parts per billion or trillion range, it is important that staff of the Ministry of the Environment are aware of the current state of knowledge of such substances with respect to chemical/physical properties, environmental standards, toxicity, and human health effects, as well as industrial or commercial uses and losses.

The purpose of this handbook is to provide basic, well-referenced information on a wide variety of trace organic and inorganic substances for Ministry of the Environment staff who may have occasion to deal with such materials but do not have the resource material immediately at hand, or the time to review a number of texts and reference files in order to obtain some of the essential facts about materials that they do not encounter routinely in their day-to-day work.

It is certainly not the intention to have staff use this handbook to by-pass consultation with staff specialists or to preclude the need for a more in-depth review through literature. The handbook will, in many cases, answer fundamental questions but, as important, it will save investigators valuable time by citing the best available references for more detailed information.

## SCOPE

The thrust of this edition of the Handbook is directed towards trace contaminants in the aquatic environment. The handbook provides information on three basic categories of substances: inorganic trace pollutants, industrial organic compounds, and pesticides and agricultural chemicals. It is the long-term goal of this program to provide information on substances contained in the Ministry's priority pollutant

list currently in preparation by the Priority List Working Group as well as trace contaminants listed in other documents, for example, tables 1, 2 and 3 of "Water Management" (Blue Book). Equally important, the handbook will include substances that may not appear on any list but are of concern to Ministry staff and would be included at their request.

The range of information that can be contained in each pollutant specific monograph is broad. Initial efforts have concentrated on the aquatic effects, and human and mammalian effects sections. Some information, such as ambient levels in Ontario, are always readily available through literature and will have to be gained by other means. The initial aim of the project is to list whatever information is currently available and update information of individual substances as they become available. A monograph, therefore, does not necesarily have to be complete before it is included in the handbook. The loose-leaf format was chosen so that as sheets on new substances are prepared or information on existing substances updated, they can be placed at appropriate locations in the handbook and, in the case of revised monographs, old sheets can be discarded.

## UPDATING ASSISTANCE

Staff will be continually evaluating new information with the view of adding to or revising the handbook. However, the assistance of Ministry staff in drawing our attention to new information or providing data that could be used in the handbook would be greatly appreciated.

It should be emphasized that the intent of the handbook project is to develop a useful, practical tool for all Ministry staff dealing with trace contaminants and, to that end, we would appreciate any suggestions that would improve the various components of each monograph and any suggestions for the inclusion of potentially hazardous substances.

## COMPONENTS OF THE MONOGRAPHS

Information in this handbook is divided into three sections - Inorganic Compounds, Industrial Organic Compounds, and Pesticides and agricultural chemicals.

Within each monograph the information is subdivided into several sections described below. This format is consistent for all categories of compounds.

### IDENTIFICATION

- Each substance is identified by its most common name but alternative names are listed. A cross-referencing index of common names is included at the front of the handbook.

- The CAS (Chemical Abstract Service) number is provided for each substance. This number is unique to that substance.

- Several physical and chemical properties are provided. These include:

| | |
|---|---|
| MP | - Melting point in $^{o}C$ |
| BP | - Boiling point in $^{o}C$ |
| Solubility | - in water, unless otherwise stated |
| VP | - Vapour pressure in millimetres of mercury |
| SG | - Specific gravity at a specified temperature |
| $BOD_5$ | - 5-day biochemical oxygen demand (where applicable) |

### AQUATIC EFFECTS

- This section of each monograph provides objectives, guidelines criteria, etc. for the protection of aquatic life.

- PWQO - the Provincial Water Quality Objective for the protection of aquatic life and recreation. Where a PWQO does not exist another agency's objective may be stated in the "Others" space.

- WHOLE FISH - an objective set for the protection of those predators (e.g. fish eating birds) whose diets consist largely of fish.

- SEDIMENTS - this guideline usually refers to the MOE dredging guideline and is used to determine the suitability of dredged sediment for open-water disposal.

- AMBIENT CONCENTRATIONS in Ontario's water, sediment and biological organisms are shown, where available. In some cases, elevated levels in "problem areas" are shown.

- Other significant biological information related to the aquatic community includes:

- PARTITION COEFFICIENT (expressed as log P) - is the ratio of the concentration of a compound in octanol to its concentration in water - it can be used to indicate biological uptake, storage and biomagnification for a specific compound.

| e.g. | Log P | Bioaccumulation |
|---|---|---|
| | 6.00 | 4000 x |
| | 5.00 - 6.00 | 1000 - 4000 x |
| | 4.50 - 5.00 | 700 - 1000 x |
| | 4.00 - 4.50 | 300 - 700 x |
| | 4.00 | 300 x |

- THRESHOLD ODOUR - is the lowest concentration at which an average person can detect an odour in water. Values are expressed either as a concentration of a substance or the number of times a pure substance has to be diluted with odour free water to bring it to the threshold level.

- BIOACCUMULATION FACTOR - is a measurement (ratio) of the degree to which a substance will concentrate within biological organisms when compared to the exposure from both water (environment) and diet (food chain).

- HALF-LIFE - is the time (years, days, seconds, etc.) required to reduce the concentration of a compound in a specific media to one-half of its original level.

- SYNERGETIC, ADDITIVE or ANTAGONISTIC EFFECTS - an indication of the increased or decreased effects (e.g. toxicity) of a compound when other specific substances are present.

- TOXICITY TEST RESULTS - the $LC_{50}$ concentrations for representative species of fish, algae and invertebrates in hard and soft waters. Where available, non-lethal response concentrations are provided as well.

HUMAN AND MAMMALIAN EFFECTS

This section provides information on the significance and effects of the substance on humans. Where such information is not available, data on other mammals is provided.

- DRINKING WATER - MOE objectives. Where not available, drinking water objectives of other jurisdictions are specified.

- FISH CONSUMPTION - Guidelines for the unrestricted consumption of fish.

- TOLERANCE LIMITS IN OTHER FOODSTUFFS - Canadian, U.S. or World Health Organisation guidelines for permissible levels of a substance in food. Provided to permit an assessment of the significance of a compound in water or fish when specific guidelines for these are not available.

- Information on ACUTE TOXICITY, HALF-LIFE in humans (or mammals) and MUTAGENIC, TERATOGENIC, CARCINOGENIC, effects are provided, where available.

- MODE OF TOXIC ACTION - The specific site of the toxic reaction and the route of exposure (e.g. ingestion, inhalation, dermal).

ENVIRONMENTAL DETECTION

This part of the monograph provides information on the section and specialist within MOE's Laboratory Services Branch capable of analysing the substance in question. Detailed information on sampling techniques, analytical methods, etc. are provided in the Laboratory Services Branch publication "Outline of Analytical Methods", June, 1981.

SOURCES AND USES

This section is included to provide names of specific industrial or commercial sources, where appropriate. Information on amounts of the substance produced in or imported to Ontario as well as amounts lost to the environment is included when such information is available. Information on other sources (eg. natural) as well as uses of the substance in question is also provided.

OTHER INFORMATION

CASE STUDIES - The intention of this section is to identify instances of investigations that MOE staff have carried out for the substance detailed in the monograph. A case study may include: the cause of the problem; special survey procedures; methods of evaluating data collected; mitigation of the problem; and follow-up work. The assistance of staff throughout the Ministry in supplying case studies is required to make this section worthwhile.

REFERENCES

Wherever possible, each entry for each compound is referenced to the best, most current literature or personal communication. A file of all material referred to on the attached monographs is maintained within the Assessment Programs Unit and specific documents cited can be made available upon request.

GLOSSARY

A comprehensive glossary of terms used in the monographs is provided on page 6 of the handbook.

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PROJECT TEAM

The material in this edition of the handbook was prepared by staff of the Water Resources Branch. Questions on the monographs, suggested modifications and additions or requests for reference material should be made to Conrad de Barros, Assessment Programs Unit, Water Resources Branch, 1 St. Clair Avenue West, Toronto, 965-6954.

ABSORPTION: Penetration of one substance into the body of another.

ACCEPTABLE DAILY INTAKE (ADI): The dose that is anticipated to be without lifetime risk to humans when taken daily. It is not assumed that this dose guarantees absolute safety. The determination of the ADI is often based on the application of laboratory animal toxicity data concerning chronic (long-term) doses to the environmental doses to which humans are exposed.

ACCLIMATION: Physiological and behavioural adjustments of an organism in response to a change in environment. See also Adaption.

ACCLIMATIZATION: Acclimation of a particular species over several generations in response to marked environmental changes.

ACCUMULATION: Storage and concentration of a chemical in tissue to an amount higher than intake of the chemical. May also apply to the storage and concentration of a chemical in aquatic sediments to levels above those that are present in the water column.

ACUTE: Involving a stimulus severe enough to rapidly induce a response; in bioassay tests, a response observed within 96 hours is typically considered an acute one.

ACUTE TOXICITY: Any toxic effect that is produced within a short period of time, usually 24 to 96 hours. Although the effect most frequently considered is mortality, the end result of acute toxicity is not necessarily death. Any harmful biological effect may be the result. See also Chronic Toxicity.

ACETYLCHOLINE: Neurotransmitter; the substance which carries impulses from one nerve to another.

ADAPTATION: Change in the structure forms or habits of an organism to better fit changed or existing environmental conditions. See also Acclimation.

ADSORPTION: The taking up of one substance at the surface of another.

AEROBIC: The condition associated with the presence of free oxygen in the environment.

ALGICIDE: A specific chemical highly toxic to algae. Algicides are often applied to water to control nuisance algal blooms.

ANAEROBE: An organism for whose life processes a complete or nearly complete absence of oxygen is essential.

ANOREXIA: Loss of appetite; aversion to food.

ANTAGONISM: Reduction of the effect of one substance because of the introduction or presence of another substance; e.g., one substance may hinder, or counteract, the toxic influence of another. See also Synergism.

APPLICATION FACTOR: A factor applied to a short-term or acute toxicity test to estimate a concentration of waste that would be safe in a receiving water.

AQUATIC: Living in water.

ASSIMILATION: The transfer and incorporation of substances (e.g. nutrients by an organism or ecosystem).

ASSIMILATIVE CAPACITY: The ability of a waterbody to transform and/or incorporate substances (e.g. nutrients) by the ecosystem, such that the water quality does not degrade below a predetermined level.

BENIGN: Denoting the mild character of an illness or the non-malignant character of a neoplasm.

BENTHIC: Of or living on the bottom of a water body; benthic region, benthos.

BENTHOS: Bottom dwelling organisms, the benthos comprise: 1) sessile animals such as sponges, some of the worms and many attached algae; 2) creeping forms such as snails and flatworms; and 3) burrowing forms which include most clams and worms.

BIOACCUMULATION: Uptake and retention of environmental substances by an organism from both its environment (i.e. directly from the water) and its food.

BIOASSAY: A determination of the concentration or dose of a given material necessary to affect a test organism under stated conditions.

BIOCONCENTRATION: The amount of a substance accumulated by an organism by adsorption and by absorption via oral or other routes of entry, which results in an increased concentration of the substance by the organism or specific tissues.

BIOCONCENTRATION FACTOR: The ratio of the measured residue compared to the residue of the substance in the ambient air, water or soil environment of the organism.

BIOLOGICAL MAGNIFICATION: The magnification of a chemical along the food chain.

BW: Body weight. Usually applies to the body weight of test animals relative to an applied dose or treatment.

CARCINOGEN: Any cancer producing substance.

CARCINOGENICITY: The ability of a substance to produce malignant tumors.

CARCINOMA: Any of the various types of malignant neoplasm derived from epithelial tissue, e.g. skin, large intestine, stomach, prostate gland, breast, uterus, cervix.

C.A.S. NUMBER: Chemical Abstracts Service (CAS) Registry Numbers are unique numerical identifiers assigned to chemical sbstances recorded in the CAS Chemical Registry. This system uniquely identifies a chemical substance on the basis of an unambiguous computer-language description of its molecular structure including all stereochemical detail.

The CAS Registry Number itself has no chemical significance; it is simply a machine-checkable number assigned in sequential order to each substance as it enters the Registry System. The value of the Number lies in the fact that it is a concise and unique means of substance identification which is independent of, and therefore bridges, the many systems of chemical nomenclature.

CHOLINESTERASE: An esterase (enzyme) present in all body tissues which hydrolyses acetylcholine into choline and acetic acid. Acetylcholine is a neurotransmitter, and therefore substances that impair the function of cholinesterase enzymes are neurotoxic.

CHOLINESTERASE INHIBITOR: Any chemical allowing a buildup of acetylcholine, thereby interfering with transmission of nerve impulses.

CHRONIC: Involving a stimulus that lingers or continues for a long period of time, often one-tenth of the life span or more.

CHRONIC TOXICITY: Toxicity marked by a long duration, that produces an adverse effect on organisms. The end result of chronic toxicity can be death although the usual effects are sublethal; e.g. inhibits reproduction or growth. These effects are reflected by changes in the productivity and population structure of the community. See also Acute Toxicity.

CNS: Central nervous system: the brain and spinal cord.

CONJUNCTIVITIS: An inflammation of the mucous membrane that lines the inner surface of the eyelid and the exposed surface of the eye ball.

CONTAMINATION: The introduction of pathogenic or undesirable micro-organisms, toxic and other deleterious substances which make otherwise potable water unfit for use.

CRITERION, WATER QUALITY: A designated concentration of a constituent based on scientific judgements, that, when not exceeded will protect an organism, a community of organisms, or a prescribed water use with an adequate degree of safety.

CRITICAL LEVEL: See Threshold.

CRITICAL RANGE: In bioassays the range of magnitude of any factor between the maximum level or concentration at which no organisms die to the minimum level or concentration at which all organisms die under a given set of conditions in a given period of time.

CUMULATIVE: Brought about or increased in strength by successive additions.

CUMULATIVE ACTION: Increasingly severe effects due either to storage and concentration of a chemical in a particular organ, or to a physiological condition sustained below its threshold of proper performance.

CYANOETHYLATED PROTEIN: A protein molecule that has lost a hydrogen atom and gained a molecule of acrylonitrile.

CYANOETHYLATION: A chemical reaction involving the addition of acrylonitrile to compounds with a reactive hydrogen.

DREDGE SPOILS: The material removed from the bottom during dredging operations.

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| DREDGING GUIDLINES: | Procedural directions drafted by the Ministry of the Environment designed to minimize the adverse effects of shoreline and underwater excavation. |
| EC: | Effective concentration; producing some reaction. |
| EC-50: | Concentration of a substance producing a defined response in 50% of a test population. |
| EMESIS: | The act of vomiting. |
| ERYTHEMA: | Inflammatory redness of the skin. |
| FRY: | The stage in the life a fish between the hatching of the egg and the adsorption of the yolk sac. |
| GOAL: | An aim or objective towards which to strive; it may represent an ideal condition that is difficult, if not impossible to attain economically. |
| GUIDELINE: | Any suggestion or rule that guides or directs. |
| HALF-LIFE: | The period of time in which a substance loses half of its active characteristics (used specifically in radiological work); the time required to reduce the concentration of a material by half. |
| HAZARDOUS SUBSTANCES: | Chemical considered to be a threat to man in the environment, including substances which (individually or in combination with other substances) can cause death, disease (including cancer), behavioural abnormalities, genetic mutations, physiological malfunctions or physical deformities. |
| INCIPIENT LC-50: | The level of the toxicant which is lethal for 50% of individuals exposed for periods sufficiently long that acute lethal action has ceased. Synonymous with lethal threshold concentration. |
| INCIPIENT LETHAL LEVEL: | That concentration of an environmental identity beyond which an organism could no longer survive for an indefinite period of time. |
| INSECTICIDE: | Substances or a mixture of substances intended to prevent, destroy or repel insects. |
| IP: | Intraperitoneal; manner of injection; into abdominal cavity. |

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| IN UTERO: | Within the uterus, unborn. |
| IN VITRO: | Within glass; culture in an artificial medium. |
| IN VIVO: | Within the living organism. |
| IV: | Intravenous; manner of injection; into veins. |
| LARVA (pl. LARVAE): | An active, immature stage in an animal's life history during which its form differs from that of the adult. |
| LC: | Lethal concentration; the concentration at which death occurs. |
| LC50: | Concentration lethal to 50% of a test population. Frequently a time designation is given, such as 96 hours. See also TLm 96-hr. |
| LD50: | Doses lethal to 50% of a test population of animals. |
| LETHAL: | Involving a stimulus or effect directly causing death. |
| LIPOPHILIC: | Having an affinity for fats or other lipids. |
| MALIGNANT: | Resistant to treatment, occuring in severe form and frequently fatal. |
| MEDIAL LETHAL CONCENTRATION LC50: | The concentration of a test material that causes death to 50% of a population within a given period. |
| MEDIAN LETHAL DOSE (LD50): | The dose of a test material, ingested or injected, that kills 50% of a group of test organisms. |
| MEDIAN LETHAL LIMIT (TL50): | The concentration of a test material in a suitable diluent (experimental water) at which just 50% of the test animals are able to survive for a specified period of exposure. |
| MEDIAN TOLERANCE LIMIT (TLm): | The concentration of a tested material in a suitable diluent (experimental water) at which just 50% of the test animals are able to survive for a specified period of exposure. See also Tolerance Limit. |

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| MESODERM: | Connective tissue, muscle, blood, cardiovascular and lymphatic system; most of the urogenital system and lining of the pericardial, pleural and peritoneal cavities. |
| METASTASIS: | The shifting of a disease or its local manifestations from one part of the body to another. In cancer, the appearance of neoplasms in parts of the body remote from the primary tumor. |
| mg/kg: | Milligrams (of a substance) per kilogram of body weight; relates dosage to a standard weight rather than to varying body weights of individual test animals. Equivalent to parts per million (ppm). Also a measure of concentration. |
| MICROGRAM PER LITRE (ug/L): | For practical purposes, the equivalent of parts per billion (ppb). |
| MILLIGRAM PER LITRE (mg/L): | For practical purposes, the equivalent of parts per million (ppm). |
| MUTAGEN: | Any substance or effect which alters genetic characteristics or produces an inheritable change in the genetic material. |
| MUTAGENICITY: | The ability of a substance to induce a detectable change in genetic material which can be transmitted to progeny, or from one cell generation to another within an individual. |
| NANNOGRAM: | One trillienth part of a gram; ng/L - nannogram per litre. For practical purposes, equivalent to ppt. |
| NECROSIS: | The death of cellular material within the body of an organism. |
| NEOPLASM: | New growth, tumor, an abnormal tissue that grows by cellular proliferation more rapidly than normal and continues to grow after the initiating stimuli cease. |
| ORGANOLEPTIC: | Pertaining to or perceived by a sensory organ. |
| OXIDATIVE PHOSPHORYLATION: | The formation of "high energy" phosphoric bonds (e.g. pyrophosphates) from the energy released by the dehydrogenation (e.g. oxidation) of various substances, most notably isocitric acid in the tricarboxylic acid cycle. |

PARR: A young fish, usually a salmonid, between the larval stage and the time it begins migration to the sea.

PARTITION COEFFICIENT: The ratio of the molecular concentration of a substance in two solvents. In water pollution, usually expressed as the log of the ratio between the solubility of a substance in water and n-octanol.

PARTS PER BILLION (PPB): For practical purposes, the equivalent of micrograms per litre (ug/L).

PARTS PER MILLION (PPM): For practical purposes, the equivalent of milligrams per litre (mg/L).

PARTS PER TRILLION (PPT): For practical purposes, the equivalent of nannograms per litre (ng/L).

PESTICIDE: Any substance used to kill plants, insects, algae, fungi and other organisms; includes herbicides, insecticides, algicides, fungicides.

POLLUTION (WATER): Anything causing or inducing objectionable conditions in any watercourse and affecting adversely the environment and use or uses to which the water thereof may be put.

POTABLE WATER: Water suitable, on the basis of both health and aesthetic considerations, for drinking or cooking purposes.

P.W.Q.O.: Provincial Water Quality Objectives as outlined in Water Management: Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment. Ontario Ministry of the Environment, 135 St. Clair Ave. W., Toronto, Ontario, 1978.

RAW WATER: Surface or ground water that is available as a source of drinking water but has not received any treatment.

SARCOMA: A connective tissue neoplasm, usually highly malignant, formed by proliferation of mesodermal cells, e.g. leukemia.

SOLUBILITY: The state of being soluble; capability of being dissolved.

SUBACUTE: Involving a stimulus below the level that causes death.

SUBCHRONIC: Effects from short-term multiple dosage or exposure; usually means exposure for less than three months.

SUB-LETHAL: Involving a stimulus below the level that causes death.

SYNERGISM: The joint action of two or more substances is greater than the sum of the action of each of the individual substances; e.g., action of certain combinations of toxicants. The improvement in performance is achieved because two agents are working together. See also Antagonism.

SYNERGISTIC: Interactions of two or more substances or organisms producing a result such that the total effect is greater than the sum of the individual effects.

SYNTHESIS: The production of a substance by the union of elements or simpler compounds.

TERATOGEN: A substance that increases the incidence of birth defects.

TERATOGENICITY: The ability of a substance to produce irreversible birth defects, or anatomical or functional disorders as a result of an effect on the developing embryo.

THIOL (Group): The monovalent radical, -SH when attached to carbon, a hydrosulphide.

THRESHOLD: The chemical amount or the physiological state that must be reached before a given reaction sets in.

TLm: Medial lethal threshold; usually applies to fishes.

TLm 96-hr: TLm after 96 hours; standard measurement of toxicity to fishes adds time factor in reaction. See also LC-50.

TOXICITY: Quality, state or degree of the harmful effect resulting from alteration of an environmental factor.

TOLERANCE LIMIT (TL10 ... 100): The concentration of a substance which some specified portion of an experimental population can endure for a specified period of time with reference to a specified type of response; e.g. TL100 means that all test organisms endured the stress for the specified time; TL10 means only 10% of the test organisms could tolerate the compound stress for the specified period.

TRANSLOCATION: Movement of chemical within a plant or animal; usually refers to systemic herbicides and insecticides that are moved from the point of contact on the plant to other regions of the plant.

TROPHIC ACCUMULATION: Passing of a substance through a food chain such that each organism retains all or a portion of the amount in its food and eventually acquires a higher concentration in its flesh than in its food. See also Biological Magnification.

TROPHIC CONCENTRATION: Transfer of stored residues along a food chain; sequence of producing and consuming energy layers in an ecosystem. See also Biological Magnification.

# I N D E X

| Name | Listed As | Section |
|---|---|---|
| Chlorinated Phenols | Chlorinated Phenols (General Fact Sheet) | Industrial Organics |
| (2-chloro-1-methyl)Ether | Bis(2-chloroisopropyl)Ether | Industrial Organics |
| Chlorpyrifos | Chlorpyrifos | Pesticides |
| Chromium | Chromium | Inorganics |
| Coal Naptha | Benzene | Industrial Organics |
| Copper | Copper | Inorganics |
| m-Cresol | m-Cresol | Industrial Organic |
| o-Cresol | o-Cresol | Industrial Organic |
| p-Cresol | p-Cresol | Industrial Organic |
| Cyanoethylene | Acrylonitrile | Industrial Organics |
| Cyclohexatriene | Benzene | Industrial Organics |
| Cythion | Malathion | Pesticides |
| 2,4-D | 2,4-D | Pesticides |
| 2,4-D(B) | 2,4-D(B) | Pesticides |
| Dechlorane | Mirex | Industrial Organics |
| Diazinon | Diazinon | Pesticides |
| 1,2-Dichlorobenzene | 1,2-Dichlorobenzene | Industrial Organics |
| o-Dichlorobenzene | 1,2-Dichlorobenzene | Industrial Organics |
| ortho-Dichlorobenzene | 1,2-Dichlorobenzene | Industrial Organics |
| 1,2-Dichloroethane | 1,2-Dichloroethane | Industrial Organics |
| Dichloroisopropyl Ether | Bis(2-chloroisopropyl)Ether | Industrial Organics |
| Dichloromethane | Dichloromethane | Industrial Organics |
| Dichlorophenoxybutyric acid | 2,4-D(B) | Pesticides |
| Dibromoethane | 1,2-Ethylene Dibromide | Industrial Organics |
| 1,2-Dichloropropane | 1,2-Dichloropropane | Industrial Organics |
| di(2-ethylhexyl)Phthalate | Bis(2-ethylhexyl)Phthalate | Industrial Organics |
| 1,2-Dimethylbenzene | ortho-Xylene | Industrial Organics |
| 1,3-Dimethylbenzene | meta-Xylene | Industrial Organics |
| 1,4-Dimethylbenzene | para-Xylene | Industrial Organics |
| Dimethylnitrosamine | N-Dimethylnitrosamine | Industrial Organics |
| 1,3-Dintrobenzene | 1,3-Dintrobenzene | Industrial Organics |
| m-Dinitrobenzene | 1,3-Dintrobenzene | Industrial Organics |

| Name | Listed As | Section |
|---|---|---|
| Dinitrobenzol | 1,3-Dintrobenzene | Industrail Organics |
| 2,4-Dimethylphenol | 2,4-Dimethylphenol | Industrial Organics |
| Dioctylphthalate | Bis(2-ethylhexl)Phthalate | Industrial Organics |
| Dioxin | 2,3,7,8,-TCDD | Industrial Organics |
| Dowicide 2 | 2,4,5-Trichlorophenol | Industrial Organics |
| Dowicide 2S | 2,4,6-Trichlorophenol | Industrial Organics |
| Dursban | Chlorpyrifos | Pesticides |
| Embutox | 2,4-D(B) | Pesticides |
| Endosulphan | Endosulphan | Pesticides |
| Ethene dichloride | 1,2-Dichloroethane | Industrial Organics |
| Ethenylbenzene | Styrene | Industrial Organics |
| Ethinyl | Trichloroethylene | Industrial Organics |
| Ethylbenzene | Ethylbenzene | Industrial Organics |
| Ethylbenzol | Ethylbenzene | Industrial Organics |
| Ethylene | Tetrachloroethylene | Industrial Organics |
| 1,2-Ethylene Dibromide | 1,2-Ethylene Dibromide | Industrial Organics |
| Ethylene dichloride | 1,2-Dichloroethane | Industrial Organics |
| "Formyltrichloride" | Chloroform | Industrial Organics |
| Gesaprim | Atrazine | Pesticides |
| Guthion | Guthion | Pesticides |
| HCH | Hexachlorocyclohexane | Pesticides |
| Hexachlorobenzene | Hexachlorobenzene | Industrial Organics |
| Hexachlorocyclohexane | Hexachlorocyclohexane | Pesticides |
| Hexachlorobutadiene | Hexachlorobutadiene | Industrial Organics |
| Hexachloro-1,3-butadiene | Hexachlorobutadiene | Industrial Organics |
| 2-Hydroxytoluene | o-Cresol | Industrial Organic |
| 3-Hydroxytoluene | m-Cresol | Industrial Organic |
| 4-Hydroxytoluene | p-Cresol | Industrial Organic |

| Name | Listed As | Section |
|---|---|---|
| Lead | Lead | Inorganics |
| Lindane | Lindane | Pesticides |
| Lorsban | Chlorpyrifos | Pesticides |
| Mercury | Mercury | Inorganics |
| Methoxychlor | Methoxychlor | Pesticides |
| Methylbenzene | Toluene | Industrial Organics |
| Methylene Chloride | Dichloromethane | Industrial Organics |
| Methylene Dichloride | Dichloromethane | Industrial Organics |
| Methylmercaptan | Methylmercaptan | Industrial Organics |
| 2-Methyl Phenol | o-Methyl Phenol | Industrial Organics |
| 3-Methyl Phenol | m-Methyl Phenol | Industrial Organics |
| 4-Methyl Phenol | p-Methyl Phenol | Industrial Organics |
| Mirex | Mirex | Industrial Organics |
| Monochlorobenzene | Monochlorobenzene | Industrial Organics |
| N-Dimethylnitrosamine | N-Dimethylnitrosamine | Industrial Organics |
| Nickel | Nickel | Inorganics |
| *Nitrobenzene | Nitrobenzene | Industrial Organics |
| Nitrobenzol | Nitrobenzene | Industrial Organics |
| N-Nitrosodiethylamine | N-Dimethynitrosamine | Industrial Organics |
| Octachlor (Octo-Klor) | Chlordane | Pesticides |
| Omal | 2,4,6-Trichlorophenol | Industrial Organics |
| PCBs | Polychlorinated-Biphenyls | Industrial Organics |
| PCP | Pentachlorophenol | Industrial Organics |
| Penta | Pentachlorophenol | Industrial Organics |
| Pentachlorophenol | Pentachlorophenol | Industrial Organics |
| Perchlorobenzene | Hexachlorobenzene | Industrial Organics |
| Perchlorobutadiene | Hexachlorobutadiene | Industrial Organics |
| Perchloroethylene | Tetrachloroethylene | Industrial Organics |
| Perchloromethane | Carbon Tetrachloride | Industrial Organics |
| Phenylamine | Aniline | Industrial Organics |
| Phenylchloride | Monochlorobenzene | Industrial Organics |

| Name | Listed As | Section |
|---|---|---|
| Phenylethane | Ethylbenzene | Industrial Organics |
| Phenylmethane | Toluene | Industrial Organics |
| Polychlorinated Biphenyls | Polychlorinated-Biphenyls | Industrial Organics |
| Primatol | Atrazine | Pesticides |
| Princep | Simazine | Pesticides |
| Propylenedichloride | 1,2-Dichloropropane | Industrial Organics |
| Pyrethrum | Pyrethrum | Pesticides |
| Quick Silver | Mercury | Inorganics |
| *Quinoline | Quinoline | Industrial Organics |
| Selenium | Selenium | Inorganics |
| Simazine | Simazine | Pesticides |
| Styrene | Styrene | Industrial Organics |
| TCDD | 2,3,7,8-TCDD | Industrial Organics |
| 2,3,7,8-TCDD | 2,3,7,8-TCDD | Industrial Organics |
| TCE | Trichloroethylene | Industrial Organics |
| 2,3,7,8-Tetrachlorodi-Benzo-p-Dioxins | 2,3,7,8-TCDD | Industrial Organics |
| Temik (10G or 15G) | Aldicarb | Pesticides |
| Tetrachloroethylene | Tetrachloroethylene | Industrial Organics |
| Tetrachloromethane | Carbon Tetrachloride | Industrial Organics |
| Thiodan | Endosulphan | Pesticides |
| Toluene | Toluene | Industrial Organics |
| Toxaphene | Toxaphene | Pesticides |
| Trichloride | Trichloroethylene | Industrial Organics |
| 2,4,5-Trichloro | 2,4,5-Trichlorophenol | Industrial Organics |
| 1,1,2-Trichloroethane | 1,1,2-Trichloroethane | Industrial Organics |
| Trichloroethene | Trichloroethylene | Industrial Organics |
| Trichloroethylene | Trichloroethylene | Industrial Organics |
| Trichloroform | Chloroform | Industrial Organics |
| Trichloromethane | Chloroform | Industrial Organics |
| 2,4,5-Trichlorophenol | 2,4,5-Trichlorophenol | Industrial Organics |
| 2,4,6-Trichlorophenol | 2,4,6-Trichlorophenol | Industrial Organics |

| Name | Listed As | Section |
|---|---|---|
| Vangard B.T. | Benzothiazole | Industrial Organics |
| Vinyl Cyanide | Acrylonitrile | Industrial Organics |
| Vinyl Benzene | Styrene | Industrial Organics |
| Vinyl Trichloride | 1,1,2-Trichloroethane | Industrial Organics |
| Weedex | 2,4-D | Pesticides |
| Weedone | 2,4-D | Pesticides |
| meta-Xylene | meta-Xylene | Industrial Organics |
| m-Xylene | meta-Xylene | Industrial Organics |
| ortho-Xylene | ortho-Xylene | Industrial Organics |
| o-Xylene | ortho-Xylene | Industrial Organics |
| para-Xylene | para-Xylene | Industrial Organics |
| p-Xylene | para-Xylene | Industrial Organics |
| 2,4-Xylenol | 2,4-Dimethylphenol | Industrial Organics |
| m-Xylenol | 2,4-Dimethylphenol | Industrial Organics |
| Zinc | Zinc | Inorganics |

# INORGANIC SUBSTANCES

## (ELEMENTS)

IDENTIFICATION

I Name Arsenic

Chem. Symbol: As CAS #: 7440-38-2 Date: September 22, 1981

Other Common Names:

II Physical Chemical Properties

MP: 615°C (1) BP: Solubility: VP: S.G.: 5.7 (1)

$BOD_5$: NA

III Appearance and other properties Gray shiny brittle metallic looking rhombohedral crystals. Sublimes from solid to gas at 615°C. (1)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 100 ug/l (unfiltered) (2) Others: 57 ug/l 24 hr. ave., never exceed 130 ug/l US EPA (3)

Whole Fish (for the protection of fish eating birds):

Sediments: 8.0 ppm based on dry weight (Dredging Guidelines) (4)

II Ambient Concentrations in Ontario

Water: 1 to 2 ug/l Great Lakes water (5); 1 to 50 ug/l Canadian rivers. (6)

Sediment: 0.5 to 14 mg/kg Great Lakes sediment. (5)

Biological Organisms: 0.2 to 0.5 mg/kg Canadian fresh water fish. (5)

III Biological Information

Partition Coef.: Threshold Odour: Bioaccumulation Factor: undefined*

Half-Life - Water: Sediment: Fish:

Synergistic, Additive, Antagonistic Factors: Arsenic toxicity is controlled by dissolved oxygen concentration pH, redox potential and ionic state of the element. (5)

| Toxicity Testing: Concentration | Species | Test Water | Results |
|---|---|---|---|
| 1,000 ug/L | Rainbow Trout Juvenile | 127 mg/L as $CaCO_3$ | Decrease in fat wt.gain (3) |
| 10,440 ug/L | Brook Trout | 140-152 mg/L as $CaCO_3$ | $LC_{50}$ |
| 18,618 ug/L | Goldfish Juvenile | 140-152 mg/L as $CaCO_3$ | $LC_{50}$ |
| 10,556 ug/L | Fathead Minnow | 140-152 mg/L as $CaCO_3$ | $LC_{50}$ |

* Insufficient information-bottom dwelling fish accumulate arsenic above background concentrations. (5)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: 0.05 mg/l (7) Other: 0.05mg/L (MAC) Health & Welfare Canada (8)

Fish Consumption:

Tolerance Limits in Other Foodstuffs: 2.6 ppm in any foodstuff U.S. Food and Drug Administration. (9)

II Effects

Acute Toxicity: 180 mg (LD70)(1-2.5 mg/kg) in humans (5) Half-Life: Long in humans (10)
15-40 mg/kg LD50 in mice (5)

Mutagen: positive (mice and hamsters) (4) Teratogen: potential (9) Carcinogen: Human positive (9)

Mode of Toxic Action: Uncoupling of oxidative phosphorylation. (5)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Inorganic Trace Contaminants Lab Specialist: B. Loescher Phone: 248-3346

Others:

II Detection Limits

Water: 0.001 mg/l (6) Biological: 0.125 ug/g (6) Air: -

Sediment: 0.025 ug/g (6) Other: 0.025 ug/g (vegetation) (6)

SOURCES AND USES

I Industrial and Commerical Sources Produced as a by-product during the processing of non-ferrous metal ores; also emitted as a by-product of coal power production. (9)

Amt. Produced: Consumed: Discharge: Air: Water: 100 lbs. (10) Land:

Sources: Naturally occurs in non-ferrous metal ores and has an average concentration of 5 mg/kg in the earth's crust (9).

Uses: Used in the manufacturing and production of glass, cloth, electrical semi-conductors, fertilizers pesticides, detergents and commercial grade sulfuric acid. (9)

OTHER INFORMATION

I Case Studies

REFERENCES

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(2) Ontario Ministry of the Environment. Water Management, Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment. November, 1978.

(3) United States Environmental Protection Agency. Ambient Water Quality Criteria for Arsenic. Criteria and Standards Division. United States Environmental Protection Agency. Washington, D.C. 20460. 1980.

(4) Ontario Ministry of the Environment. Evaluating Construction Activity Impacting on Water Resources. Prepared by D. Persaud and W.D. Wilkins, Ministry of the Environment, Water Resources Branch. January, 1976.

(5) Canada Department of Environment. Guidelines for Surface Water Quality. Vol. 1 Inorganic Chemical Substances: Arsenic. Inland Waters Directorate, Water Quality Branch, Ottawa, Canada, 1979.

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(7) Ontario Ministry of the Environment. Ontario Drinking Water Objectives. Revised September 1981. In Press. Ontario Ministry of the Environment. 135 St. Clair Avenue West, Toronto, Ontario.

(8) Canada Department of Health and Welfare. Guidelines for Canadian Drinking Water Quality, 1978. Catalogue No. H48-10/1978. Canadian Government Publishing Centre, Supply and Services Canada, Hull, P.Q.

(9) Michigan State, Department of Natural Resources. Critical Materials Registar 1979. Environmental Protection Bureau, Environmental Services Division. Publication Number 4833-5323.

(10) Ontario Ministry of the Environment. A Water Pollution Control Status Report. Active Mining Operations in the Province of Ontario. Ministry of the Environment, 2nd Printing, June 1, 1979.

IDENTIFICATION

I Name: Cadmium

Chem. Symbol: Cd CAS #: 7440-43-9 Date: October 8, 1981

Other Common Names:

II Physical Chemical Properties

MP: 321°C BP: 765°C Solubility: insoluble VP: S.G.: 8.65 (1)

$BOD_5$:

III Appearance and other properties Silver white, blue tinged lustrous metal. Easily cut with a knife. (1)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 0.2 ug/l unfiltered water (2) Others: medium hard water: 0.025 ug/l. (3)

Whole Fish (for the protection of fish eating birds): 0.0002 mg/kg IJC (1977) (3)

Sediments: 1.0 ppm based on dry weight (Dredging Guidelines) (4)

II Ambient Concentrations in Ontario

Water: 0.01 mg/l in natural waters (8).

Sediment:

Biological Organisms: Fish from Canadian inland waters:- 0.06 mg/kg unpolluted; 0.13 mg/kg polluted (5)

III Biological Information

Partition Coef.: Threshold Odour: Bioaccumulation Factor: Bioconcentration Variable: 3 to 12,400 (3)

Half-Life - Water: Sediment: Fish: 17 to 32 days (Trout) (5)

Synergistic, Additive, Antagonistic Factors: Components of water hardness, Zn, Se and Cu are known to act antagonistically with Cd. (5)

Toxicity Testing:

| Concentration | Species | Test Water | Results |
|---|---|---|---|
| 6 ug/L | Rainbow Trout | 23 mg/L as $CaCO_3$ | 186-hr LC10 (3) |
| 1.0 ug/L | Rainbow Trout | 23 mg/L as $CaCO_3$ | 200-hr LC10 |
| 0.7 ug/L | Rainbow Trout | 23 mg/L as $CaCO_3$ | 200-hr LC10 |
| 0.8 ug/L | Rainbow Trout | 23 mg/L as $CaCO_3$ | 200-hr LC10 |
| 20 ug/L | Rainbow Trout | 326 mg/L as $CaCO_3$ | 96-hr LC20 |
| 5.2 ug/L | Rainbow Trout | 54 mg/L as $CaCO_3$ | 408-hr LC50 |

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: 0.005 mg/l (11) Other: 0.005 mg/l Health and Welfare Canada (10)

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: 130-180 mg/kg-bw in rats (14-day LD50) (5) Half-Life: 10 to 30 years in humans (5)

Mutagen: conflicting information Teratogen: positive (rats) (3) Carcinogen: Strongly suspected (6)

Mode of Toxic Action: Ingestion of large doses of Cd, through contaminated food or drink, results in acute gastro intestinal effects. Excessive exposure to Cd via inhalation may cause acute or chronic lung disease and chronic reneal disease (latter can appear after long term exposure via food). (7)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Inorganic Trace Contaminant  Lab Specialist: B. Loescher  Phone: 248-3346

Others:

II Detection Limits

Water: 0.0002 mg/L (8)  Biological: 0.025 ug/g (8)

Sediment: 0.30 mg/g (8)  Other: 0.03 mg/l (sewage); 0.02 mg/l (Ind. wastes) (8)

SOURCES AND USES

I Industrial and Commerical Sources Manufacturers of batteries, paint and pigments, photochemistry industry (smoke detectors). (9)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Sources: Weathering of rocks and minerals (e.g. Greenockite), mining and smelting of zinc, copper and lead. (8)

Uses: Used in low melting eutetic and non-eutetic electroplating and as a stabilizer in plastics. (9)

OTHER INFORMATION

I Case Studies

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1) Windholz, M.ed. The Merck Index: An Encyclopedia of Chemicals and Drugs. Merck and Company, Inc., Rahway New Jersey, 1976.

2) Ontario Ministry of the Environment. Water Management, Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment. Ontario Ministry of the Environment, 135 St. Clair Avenue W. Toronto, Ontario. 1978

3) United States Environmental Protection Agency. Ambient Water Quality Criteria for Cadmium. Criteria and Standards Division. United States Environmental Protection Agency. Washington, D.C. 20460. 1980.

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5) Canada Department of Environment. Guidelines for Surface Water Quality. Vol. 1 Inorganic Chemical Substances: Cadmium. Inland Waters Directorate, Water Quality Branch, Ottawa, Canada, 1979.

6) State of Michigan, Department of Natural Resources. Critical Materials Registar 1979. Environmental Protection Bureau, Environmental Services Division. Publication Number 4833-5323.

7) Friberg, L., et al, editors. Handbook on the Toxicology of Metals. Elsevier/North-Holland Biomedical Press, 1979.

8) Ontario Ministry of the Environment. Outlines of Analytical Methods. Coordinated by Water Quality Section. Labratory Services Branch, June 1981.

9) Cadmium 77 Edited Proceedings, First International Cadmium Conference San Fransico. Published by Metal Bulletin for the Organizers: Cadmium Association. Organization New York.

10) Canada Department of Health and Welfare. Guidelines for Canadian Drinking Water Quality, 1978. Catalogue No. H48-10/1978. Canadian Government Publishing Centre, Supply and Services Canada, Hull, P.Q.

11) Ontario Ministry of the Environment. Ontario Drinking Water Objectives. Revised 1981. In Press. Ontario Ministry of the Environment, 135 St. Clair Avenue W. Toronto, Ontario.

IDENTIFICATION

I Name Chromium

Chem. Symbol: Cr CAS #: 7440-47-3 Date: September 29, 1981

Other Common Names:

II Physical Chemical Properties

MP: 1900°C BP: 2642°C Solubility: VP: - S.G.: 7.9 (1)

$BOD_5$:

III Appearance and other properties Steel-grey metal, it is superficially oxidized by damp air and when finally divided it burns rapidly if heated in flame. Hexavalent compounds ($Cr^{+6}$) are the most important industrially and also the most toxic. (2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 100 ug/l unfiltered (3) Others: 0.04 mg/l total chromium (4)

Whole Fish (for the protection of fish eating birds):

Sediments: 25 ppm based on dry weight (Dredging Guidelines) (5)

II Ambient Concentrations in Ontario

Water: < 0.02 mg/l Canadian surface water average (4).

Sediment:

Biological Organisms: 1.0 mg/kg (whole fish) Lake Superior (4)

III Biological Information

Partition Coef.: Threshold Odour: Bioaccumulation Factor: Accumulates passively in fish. (4) Probably does not accumulate through food web.

Half-Life - Water: Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

Toxicity Testing:

| Concentration | Species | Test Water | Results |
|---|---|---|---|
| 17.6 ppm | Fathead Minnows | 20mg/L as $CaCO_3$ | 96 hr $LC_{50}$ Cr(vi) (7) |
| 27.3 ppm | Fathead Minnows | 360mg/L as $CaCO_3$ | 96 hr $LC_{50}$ Cr(vi) |
| 118. ppm | Bluegills | 20mg/L as $CaCO_3$ | 96 hr $LC_{50}$ Cr(vi) |
| 133 ppm | Bluegills | 360mg/L as $CaCO_3$ | 96 hr $LC_{50}$ Cr(vi) |
| 5.07 ppm | Fathead Minnows | 20mg/L as $CaCO_3$ | 96 hr $LC_{50}$ Cr(vi) |
| 67.4 ppm | Fathead Minows | 360mg/L as $CaCO_3$ | 96 hr $LC_{50}$ Cr(vi) |

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: 0.05 mg/l (10) Other: 0.05 mg/l (MAC) Health & Welfare Canada (8)

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: 210 mg/kg ($K_2Cr_2O_7$) in dogs (6)
10 mg/kg ($K_2Cr_2O_7$) in guinea pigs (6)

Half-Life:

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action: Cr (vi) is a nephrotoxin but at high levels it apparently has an effect on the CNS (6)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Inorganic Trace Contaminants  Lab Specialist: B. Loescher  Phone: 248-3346

Others:

II Detection Limits

Water: 0.002 mg/l (total Cr) (7)  Biological: 0.25 mg/kg (total Cr)(7)
0.01 mg/l Cr(vi) (7)
Sediment: 3 mg/g (total Cr) (7)  Other:

SOURCES AND USES

I Industrial and Commerical Sources Used as a substitute for tungsten in the manufacture of cutting tools, found in leather tanning industry, wood preservation industry, electroplating industry, in the wool and fur trades as a mordant fixative for dyeing and in the electrophotographic industry.

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Weathering of rock and burning of fossil fuels. (7)

Uses: Cr is used as a pigment in paints, inks, rubber and ceramics as an alloy, and as a constituent of corrosion inhibitive paint (zinc-chromate primer) on aeroplane parts. (1)

OTHER INFORMATION

I Case Studies

REFERENCES


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2) Browning, Ethel M. Toxicity of Industrial Metals. 2nd ed. Butterworths, London. 1961

3) Ontario Ministry of the Environment. Water Management, Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment. November, 1978.

4) Canada Department of Environment. Guidelines for Surface Water Quality. Vol. 1 Inorganic Chemical Substances: Chromium. Inland Waters Directorate, Water Quality Branch, Ottawa, Canada, 1979.

5) Ontario Ministry of the Environment. Evaluating Construction Activity Impacting on Water Resources. Prepared by D. Persaud and W.D. Wilkins, Ministry of the Environment, Water Resources Branch. January, 1976.

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7) Ontario Ministry of the Environment. Outlines of Analytical Methods. Coordinated by Water Quality Section. Labratory Services Branch, June 1981.

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9) United States Environmental Protection Agency. Ambient Water Quality Criteria for Chromium. Criteria and Standards Division. United States Environmental Protection Agency. Washington, D.C. 20460. 1980.

10) Ontario Ministry of the Environment. Ontario Drinking Water Objectives. Revised, September 1981. In Press. Ontario Ministry of the Environment. 135 St. Clair Avenue West, Toronto, Ontario.

IDENTIFICATION

I Name Copper

Chem. Symbol: Cu CAS #: 7440-50-8 Date: October 13, 1981

Other Common Names:

II Physical Chemical Properties

MP: 1083°C (1) BP: 2595°C (1) Solubility: VP: S.G.: 8.99 (1)

$BOD_5$:

III Appearance and other properties Reddish lustrous, ductile, malleable metal. Elemental copper sparingly soluble in water. Solubility of copper salts variable. (1)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 5 ug/l unfiltered (2) Others: 0.01 of 96-hr LC50 (U.S. EPA) (3)

Whole Fish (for the protection of fish eating birds):

Sediments: 25 ppm based on dry weight (Dredging Guidelines). (4)

II Ambient Concentrations in Ontario

Water:

Sediment: 0.5 to 277.5 mg/kg Great Lakes, with concentration and distribution reflecting urban industrial development. (5)

Biological Organisms:

III Biological Information

Partition Coef.: Threshold Odour: Taste threshold in water: 1-5 mg/l (2) Bioaccumulation Factor:

Half-Life - Water: Sediment: Fish:

Synergistic, Additive, Antagonistic Factors: Cu and Ni, in combination, are synergistic in their toxic effects on algae. Cu is essential for plant and animal nutrition. (5)

| Toxicity Testing: Concentration | Species | Test Water | Results |
|---|---|---|---|
| 4 ug/l to 15 ug/l | Freshwater fish | - | Behaviour is modified (6) |
| 10 ug/l to 100 ug/l | Freshwater fish | - | Growth is modified |
| 11 ug/l to 2,300 ug/l | Freshwater fish | - | Adult lethality |
| 12 ug/l to 200 ug/l | Freshwater fish | - | Reproduction affected |
| 12 ug/l to 200 ug/l | Freshwater fish | - | Larval lethality |
| 27 ug/l to 60 ug/l | Freshwater fish | - | Osmoregulation affected |
| 27 ug/l to 100 ug/l | Freshwater fish | - | Blood chemistry modified |

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: 1 mg/l (10) Other: 10 mg/l (MAC) Health and Welfare Canada (9)

Fish Consumption:

Tolerance Limits in Other Foodstuffs: A daily intake of 2 mg is required for normal body functions. (7)

II Effects

Acute Toxicity: Half-Life: 4 weeks in humans (8)

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action: Ingestion causes gastro-intestinal disturbances. Inhalation of Cu fumes may cause metal fume fever. Ingestion can result in blood, kidney and liver damage. Recovery is usually rapid removal from exposure. (8)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Inorganic Trace Contaminants  Lab Specialist: Dr. B. Loescher  Phone: 248-3346 (7)

Others:

II Detection Limits

Water: 0.001 mg/l (7)  Biological: 0.125 mg/kg (7)

Sediment: 1 mg/kg (7)  Other:

SOURCES AND USES

I Industrial and Commerical Sources Producers of textiles, paints, electrical products, discharges from smelting operations and tailings ponds. (7)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Contact with brass and copper plumbing, copper salts as slimicides in water distribution systems. (7)

Uses: Used in a wide variety of metal alloys and electrical equipment salts of copper are used as insectides, and fungicides. (8)

OTHER INFORMATION

I Case Studies

REFERENCES


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6) Canada National Research Council. Associate Committee on Scientific Criteria for Environmental Quality. Copper in the Aquatic Environment. Chemistry Distribution and Toxicology. National Research Council of Canada, Publications. N.R.C.C. 16454. Ottawa, Canada, K1A 0R6

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8) Browning Ethel M. Toxicity of Industrial Metals. 2nd ed. Butterworths. London. 1961.

9) Health and Welfare Canada. Guidelines for Canadian Drinking Water Quality, 1978. Catalogue No. H48-10/1978. Canadian Government Publishing Centre, Supply and Services Canada. Hull, P.Q.

10) Ontario Ministry of the Environment. Ontario Drinking Water Objectives. Revised. September, 1981. In Press.

IDENTIFICATION

I Name Lead

Chem. Symbol: Pb CAS #: 7439-92-1 Date: October 26, 1982

Other Common Names:

II Physical Chemical Properties

MP: 327.4°C (1) BP: 1740°C (1) Solubility: 0.5 mg/L in soft water (1) S.G.: 11.34 (1)
Solubility: 0.03 mg/L in hardwater

$BOD_5$:

III Appearance and other properties Blueish white silvery-gray metal. Highly lustrous when freshly cut. Very soft and malleable. Easily cast, melted, rolled and extruded. (1)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 5 ug/l soft water; 25 ug/l hard water (2) Others:

Whole Fish (for the protection of fish eating birds): No objective available. The main problems in wildfowl are associated with ingestion of lead shot. (3)

Sediments:

II Ambient Concentrations in Ontario

Water: 0-10 ug/l and a few ranging to 30 ug/l in Canadian raw waters. (4)

Sediment: 26 ug/kg mean Ottawa R., 42 ug/kg mean Rideau R.; values greater in certain locations 390 ug/kg sewage plant and 1344 ug/kg near snow dump. (4)

Biological Organisms: Fish:- 0.19 mg/kg uncontaminated site; 1.78 mg/kg contaminated site. (3)

III Biological Information

Partition Coef.: Threshold Odour: Bioaccumulation Factor:

Half-Life - Water: Sediment: Fish:

Synergistic, Additive, Antagonistic Factors: Water hardness, alkalinity, pH and dissolved oxygen act antagonistically on the toxicity of lead. (5)

| Toxicity Testing: Concentration | Species | Test Water | Results |
|---|---|---|---|
| 5.5 mg/L | Copepod (*Cyclops abyssorum*) | 23 mg/L as $CaCO_3$ | 48 hr. LC50 (6) |
| 0.45 mg/L | Water flea (*Daphnia magna*) | 44 mg/L as $CaCO_3$ | 48 hr. LC50 |
| 0.03 mg/L | Water flea (*Daphnia magna*) | 45 mg/L as $CaCO_3$ | 16% impairment of reproduction |
| 0.004-0.0076 mg/L | Rainbow Trout (exposed Prehatch) | 28 mg/L as $CaCO_3$ | MATC* |
| 0.0146-0.0076 mg/L | Rainbow Trout (exposed | 28 mg/L as $CaCO_3$ | MATC* |

* Maximum acceptable toxicant concentration

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: 0.05 mg/L (11) Other: Maximum acceptable: 0.05 mg/L (7)

Fish Consumption: 0.5 ppm max. allowed in fish protein (note fish protein) (8)

Tolerance Limits in Other Foodstuffs: Lead tolerance in beverages (milk, fruit juices, mineral water) range from 0.15 to 0.5 ppm. The acceptable limit of Pb in ready-to-serve infant formula is 0.08 ppm. (8)

II Effects

Acute Toxicity: Half-Life:

Mutagen: Teratogen: Carcinogen: Animal positive (12)

Mode of Toxic Action: Causes damage to blood forming system by inhibiting hemoglobin synthesis in precursor cells and altering or interfering with red blood cell survival and maturation of red blood cells; Pb also effects both enzymes dependent on sulfhydryl groups and mitochondria. (5, 6)
The daily intake of lead in Canada ranges from 0.073 to 0.139 mg/person.

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Inorganic — Lab Specialist: B. Loescher — Phone: 248-3346

Others:

II Detection Limits

Water: 0.003 mg/L (10) — Biological: 0.75 mg/kg (8)

Sediment: 3 mg/kg (10) — Other:

SOURCES AND USES

I Industrial and Commerical Sources: Cement and battery industry; Plating wastes; combustion of fossil fuels; Lead smelting. (6)

Amt. Produced: — Consumed: — Discharge: Air: — Water: — Land:

Other Sources: mine drainage; rainfall; lead occurs naturally in the earth's surface at an average concentration of 12.5 mg/kg. (6)

Uses: Cable sheathing; tank lining; roofing and sound anttenuating materials; shot; and in the form of tetraethyl lead as an antiknock agent. (6)

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IDENTIFICATION

I Name Mercury

Chem. Symbol: Hg CAS #: 7439-97-6 Date: May 17, 1984

Other Common Names: Quick silver

II Physical Chemical Properties

MP: -38.9 °C BP: 356.7°C Solubility: VP: $2 \times 10^{-3}$ mmHg; S.G.: 13.3

$BOD_5$:

III Appearance and other properties Silvery white heavy mobile liquid metal. Slightly volatile at ambient temperature. (1)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 0.2 ug/l: filtered water Others: 0.05 ug/l (3)

Whole Fish (for the protection of fish eating birds): 0.5 mg/kg total mercury (3)

Sediments: 0.3 ppm dry weight (4)

II Ambient Concentrations in Ontario

Water: 0.05 ug/l (5)

Sediment: 0.1 mg/kg dry weight (6)

Biological Organisms: Fish in uncontaminated water range from 0.01 mg/kg to over 2.0 mg/L for some old, predatory fish. (11)

III Biological Information

Partition Coef.: Threshold Odour: Bioaccumulation Factor: At least 17,000

Half-Life - Water: Sediment: Fish: 1 to 3 years (7)

Synergistic, Additive, Antagonistic Factors: Co and Se have an antagonistic effect on Hg toxicity.

Toxicity Testing:

| Concentration | Species | Test Water | Results |
|---|---|---|---|
| 0.23 ug/l | Fathead minnow | - | 92% dead after 3 mos. Methylmercuric chloride |
| 0.4ug/l to 0.8ug/l | Fathead minnow | - | all dead after 3 mos. Methylmercuric chloride |
| 29 ug/l | Brook Trout | - | 6mos. gross toxic symptoms.Methylmercuric chloride |
| 0.93 ug/l | Brook Trout | - | 94% mortality after 2 years exposure |
| 8.5 ug/l | Rainbow Trout | - | LC50 phenylmercuric acetate |
| 3.0 ug/l | Rainbow Trout | - | LC50 methylmercuric chloride |
| 310 ug/l | Rainbow Trout | - | LC50 mercuric chloride (8) |

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: 0.001 mg/l (9) Other: Not to exceed 0.001 mg/l (10)

Fish Consumption: Unrestricted - 0.5 mg/kg. Restricted consumption of fish containing between 0.5 and 1.5 mg/kg is permitted in accordance with the qualifications in the "Guide To Eating Ontario Sport Fish". (11)

Tolerance Limits in Other Foodstuffs: 0.5 mg/kg total Hg in edible parts of fish. (13)
0.05 mg/kg in food other than fish. (15)

II Effects

Acute Toxicity: Half-Life: 70 days average for methylmercury in humans (15)

Mutagen: Teratogen: confirmed (17) Carcinogen:

Mode of Toxic Action: All forms of mercury are toxic, especially organo-mercurial compounds. Symptoms of poisoning depend upon the form of mercury, route of entry, duration of exposure and dose. Symptoms include nervous disorders, incoordination, weakness and death. (14, 15)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Inorganic trace contaminants  Lab Specialist: Dr. B. Loescher  Phone: 248-3346

Others:

II Detection Limits

Water: 0.05 ug/l  Biological: 0.01 mg/kg  Air: - (5)

Sediment: 0.01 mg/kg  Other:

SOURCES AND USES

I Industrial and Commerical Sources Electrical and chemical industries.

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Natural evaporation, burning of fossil fuels, breakdown of rocks and minerals containing Hg. (3)

Uses: Electrical industry including mercury vapour lamps, switches, batteries. (3)

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17) Michigan State, Critical Materials Register, 1980. Publication Number 4833-5323 Environmental Services Division, Michigan Department of Natural Resources. P.O. Box 30028, Lansing, Michigan. 48909.

IDENTIFICATION

I Name Nickel

Chem. Symbol: Ni CAS #: 7440-02-0 Date: October 23, 1981

Other Common Names:

II Physical Chemical Properties

MP: 1555°C BP: 2837 °C Solubility: VP: S.G.: 8.9

$BOD_5$:

III Appearance and other properties Lustrous, hard, white, ferromagnetic metal. Face centered cubic crystals

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Unfiltered water: not to exceed 25ug/l (2) Others: 25ug/L - soft water 250 ug/l Hard Water (3)

Whole Fish (for the protection of fish eating birds):

Sediments: 25 ppm (based on dry weight) (4)

II Ambient Concentrations in Ontario

Water: 2 ug/l to 4 ug/l in Lakes Erie and Ontario. Sudbury: treated drinking water: 0.2 mg/l average concentration. (5)

Sediment: 20 mg/kg average in Rideau R. (5)

Biological Organisms: Fish (N.W. Territory) 0.1 mg/kg (dry wt.) (5)

III Biological Information

Partition Coef.: Threshold Odour: Bioaccumulation Factor: No bioconcentration in food chain (5)

Half-Life - Water: Sediment: Fish:

Synergistic, Additive, Antagonistic Factors: Cu and Ni act synergistically to suppress growth of algae. (5)

| Toxicity Testing: Concentration | Species | Test Water | Results |
|---|---|---|---|
| 0.73 mg/l | Fathead minnow | - | reproductive impairment |
| 0.11 mg/l | " " | - | Embryos and larvae affected (6) |
| 0.03 mg/l | Water flea | - | Significant reproductive (7) impairment |

Maximum acceptable toxicant concentration for fathead minnows - 0.39 to 0.73 ug/l. (6)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: None specified Other: 0.25 mg/ L Raw water subject to conventional treatment(Environment Canada) (3)

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: 2 mg/kg injected in rats (7) renal toxicity Half-Life: 3-5 years in nasal mucosa (7)

Mutagen: not specified Teratogen: not specified Carcinogen: Strongly suspected (9)

Mode of Toxic Action: Massive injections of soluble nickel salts into rodents interferred with glucose metabolism, the immunological system and neuromescular transmission. Nickel is an essential trace element Nickel is excreted very quickly via the kidneys and feces. (5)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Inorganic Trace contaminants  Lab Specialist: Dr. B. Loescher  Phone: 248-3346

Others:

II Detection Limits

Water: 0.002 mg/l  Biological: 0.25 mg/kg

Sediment: 3 ug/kg  Other:

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced: 180,929 tonnes (5) Consumed: 8000 tonnes approx. Discharge: Air: approx. 2000 T/yr.(7)

Other Sources:

Uses: Stainless steel, nickel plating, nickel alloys used in nuclear, electronic, marine and aerospace applications. (4)

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IDENTIFICATION

I Name Selenium

Chem. Symbol: Se CAS #: 7782-49-2 Date: October 19, 1981

Other Common Names:

II Physical Chemical Properties

MP: 217°C BP: 2600 °C Solubility: insoluble VP: S.G.: 4.81°C

$BOD_5$:

III Appearance and other properties In a pure state Se has three forms; amphorous vitreous black, dark red monoclinic crystals or lustrous gray metallic (most stable form). Se is a semi-metal, metalloid. (1)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: unfiltered water: not exceed 100 ug/L (2) Others: U.S. EPA 35 ug/L as a 24 hr. ave. and the concentration should not exceed 260 ug/L any time. (3)

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: Great Lakes water range: < 1 ug/L to 8 ug/L. (5)

Sediment: Great Lakes sediment range: 0.20 to 2.0 mg/kg. (5)

Biological Organisms: Concentration range: Great Lakes fish - 0.06 to 2.0 mg/kg (5)

III Biological Information

Partition Coef.: Threshold Odour: Bioaccumulation Factor:

Half-Life - Water: Sediment: Fish: 62.9 days (3)

Synergistic, Additive, Antagonistic Factors: The toxicity of selenium is antagonized by arsenic and synergized by fluoride. Selenium has an antagonistic effect on the toxicity of cadmium, organic mercury silver and thallium. (3)

Toxicity Testing:

| Concentration | Species | Test Water | Results |
|---|---|---|---|
| 2,100 ug/L | Fathead minnow (Fry) | Selenium Dioxide | LC50 (3) |
| 5,200 ug/L | Fathead minnow (Juvenile) | Selenium Dioxide | LC50 |
| 1,000 ug/L | Fathead minnow | Sodium Selenite | LC50 |
| 11,800 ug/L | Fathead minnow | Sodium Selenite | LC50 |
| The acute toxicity of selenite is directly related to water temperature. (3) | | | |
| 40 to 80 ug/L | Rainbow Trout | Sodium Selenite | no long term effect on eggs and fry (5) |

The toxicity of Se varies with the chemical form.

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: 0.01 mg/L (7) Other: 10 ug/L US EPA (3)

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: 3mg Se/Kg of diet in rodents (5) Half-Life: 11 days in humans (5)

Mutagen: Teratogen: known teratogen Carcinogen: negative (3)

Mode of Toxic Action: Selenium compounds primarily affect the central nervous system.
The average adult intake of Se is roughly 130 to 150 ug/day. (3)
Human daily dietary requirement 200 ug/day. (5)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Inorganic Trace Contaminants  Lab Specialist: B. Loescher  Phone: 248-3346

Others:

II Detection Limits

Water: 0.001 mg/L (6)  Biological:  Air:

Sediment: 0.025 mg/kg (6)  Other: (vegetation) 0.025 mg/kg (6)

SOURCES AND USES

I Industrial and Commerical Sources Se is used in the manufacturing of glass, electronic devices, pigments dyes and insecticides. It is also used in veternary medicine and anti-dandruff shampoos. (5)

Amt. Produced: 56 tonnes Consumed: Total Canadian consumption 14 tonnes (5) Discharge: Air:  Water:

Other Sources: Se occurs naturally in the earth's crust and it may enter water courses through the degradation of rock. (5)

Uses: Se is added to fertilizers as a growth stimulant. It is also used in photocopying machine chemicals (5)

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IDENTIFICATION

I Name Zinc

Chem. Symbol: Zn CAS #: 7440-66-6 Date: October 1, 1981

Other Common Names:

II Physical Chemical Properties

MP: 419.5°C BP: 908°C Solubility: VP: S.G.: 7.14 (1)

$BOD_5$:

III Appearance and other properties Blueish-white lustrous metal. Distorted hexagonal, close-packed structure. (1)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: unfiltered water: not exceed 30 ug/L (2) Others: U.S. EPA 0.01 of the 96-hr LC50 (3)

Whole Fish (for the protection of fish eating birds):

Sediments: 100 ppm (Dredging Guidelines) based on dry weight. (4)

II Ambient Concentrations in Ontario

Water: Canadian surface water average 0.06 mg/L. (5)

Sediment: Lake Superior 80-160 mg/kg; Lake Ontario (top layer of sediment) 319-600 mg/kg (5)

Biological Organisms: Zn is an essential element for plant and animal nutrition (5)

III Biological Information

Partition Coef.: Threshold Odour: Bioaccumulation Factor:

Half-Life - Water: Sediment: Fish:

Synergistic, Additive, Antagonistic Factors: Zn exhibits synergism with copper (in soft water) and certain heavy metal salts have a synergistic effect on zinc's toxicity. Water hardness is antagonistic to zinc's toxicity (6)

| Toxicity Testing: Concentration | Species | Test Water | Results |
|---|---|---|---|
| 0.01 mg/L | Trout (General) | | Toxic to ova and young (6) |
| 0.15 mg/L | Trout (General) | | Toxic |
| 0.01 mg/L | Rainbow Trout | | Killed 54% in 28 days, Alvins |
| 0.09 mg/L | Rainbow Trout | | 96-hr. $TL_{50}$ |
| 0.15 mg/L | Salmon (General) | | Toxic, fry |
| 8.0 mg/L | Fish (General) | softwater | Zn alone tolerated 8 hrs. |
| 1.0 mg/L | Fish (General) | softwater | With 0.25 mg/L Cu most fish died in 8hrs. |

Toxic ion = aquoion = $(Zn(H_2O)_6)$ Other effects vary with D.O.Temp. and hardness

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: should not exceed 5 mg/L (2) Other: U.S. EPA 5 mg/L (3)

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: LD50 350 mg/kg in rats (7)
LD50 200 mg/kg in guinea pigs (7)

Half-Life: 162-500 days in humans (6)

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action: Inhalation of zinc oxide fume gives "metal fume fever". (9)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Inorganic Trace Contaminants  Lab Specialist: B. Loescher  Phone: 248-3346

Others:

II Detection Limits

Water: 0.001 mg/L (8)  Biological: 0.125 mg/kg (8)

Sediment: 1 ug/kg (8)  Other:

SOURCES AND USES

I Industrial and Commerical Sources Galvinizing Industry, Plating industry, Dyestuff and Paint industry. (7)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources:

Uses: Zinc occurs naturally in combination with many minerals, its chief ores being sphalerite the sulphide, calamine and the carbonate. It is also present in all plants in varying amounts. (9)
Uses: Zn is used in the manufacturing of brass, in the plating industry as an alternative to cadmium, in the dyestuff and paint industry as a dust, Zn is also used as a coating on iron and steel, and as a constituent of alloys with copper, nickel, aluminum and magnesium. (7)

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# INDUSTRIAL ORGANIC COMPOUNDS

IDENTIFICATION

I Name Acrylonitrile

Chem. Symbol: $CH_2 = CHCN$ CAS #: 107-13-1 Date: May 17, 1984

Other Common Names: Vinyl Cyanide, 2-Propenonitrile, Cyanoethylene, VCN

II Physical Chemical Properties

MP: -83°C (1) BP: 77.4°C (1) Solubility: 73500 mg/L at 20°C (2) VP: 100 mmHg at 23°C (1) S.G.: 0.8004 (1)

$BOD_5$: 0.72 (1)

III Appearance and other properties Flammable, colourless liquid, has a flash point of 0°C. It forms explosive mixtures with air at about 3.05 - 17% by volume. Acrylonitrile is miscible with most organic solvents. May polymerize spontaneously, particularly in the absence of oxygen or on exposure to concentrated alkali. On standing, may slowly develop a yellow colour particularly after excess exposure to light. (3,4)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO:*Substance with Unidentified Tolerance Limits (Table 3). (5) Others: 130 ug/L 24-hr. avg. 300 ug/L max. at any time (U.S. EPA). (6)

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.:-0.14 (calculated)(2) Threshold Odour: Bioaccumulation Factor: see **below for explanation

Half-Life - Water: Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 14.3 mg/L | Fathead Minnows | Hard Water | 96hr - TLm | (1) |
| 18.1 mg/L | Fathead Minnows | Soft Water | 96hr - TLm | |
| 11.8 mg/L | Bluegill | Soft Water | 96hr - TLm | |
| 25 mg/L | Bluegill Sunfish | Soft Water | 24hr - TLm | |

* Moderately toxic, may produce fish tainting. (5)

** With a partition coef. of -0.14 (calculated), acrylonitrile would not be expected to accumulate in aquatic organisms. There is a possibility that it will react with amino and sulfhydryl groups of biological proteins. Acrylonitrile, as a distinct molecule, would not accumulate but would result in the in the accumulation of cyanoethylated proteins. (2)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other: U.S. EPA 0.058 ug/L for $10^{-5}$ lifetime risk of cancer*. (6)

Fish Consumption:

Tolerance Limits in Other Foodstuffs: U.S. F.D.A. banned plastic soft drink bottles made of acrylonitrile and set a maximum of 11 ppm unreacted monomer content in nitrile rubber that comes into contact with foods. (7)

II Effects

Acute Toxicity: 35 mg/kg (LD50) in mice (oral)**(1,8) Half-Life:
78-240 mg/kg (LD50) in rats (oral)(1,8)
90-320 mg/kg (LD50) in guinea pigs (oral) (1,8)

Mutagen: Teratogen: potential (9) Carcinogen: animal positive *** (9)

Effects of Exposure: Inhalation:- headache, nausea, vomiting, diarrhea and weakness and mild jaundice has been reported. (8)
Dermal:- erythema (localized reddening), blisters, swelling, itching and pain. (3,8)

* Based on the consumption of 2 litres/day of water and 6.5 grams/day of fish.

** Toxic to mammals through cyanide effect. (4)

*** Preliminary indications of carcinogenicity studies are high incidence of lung and intestinal cancer in workers exposed to acrylonitrile in acrylic fiber plants. (7)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources Organic Chemical Industry, Fiber and Latex Industry. (7)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Found in plastic products, textiles, rubber products, pesticides, wigs, footwear. (7)

Uses: Manufacture of acrylic fibers. Used in the plastics, surface coatings, and adhesive industries. As a chemical intermediate in the synthesis of antioxidants, pharmacenticals, dyes, surface active age etc. Inorganic synthesis to introduce cyanoethyl group. As a modifer for natural polymers. As pesticide fumigant for stored grain. (4)

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IDENTIFICATION

I Name Aniline

Chem. Symbol: $C_6H_5NH_2$ CAS No.: 62-53-3 Date: March 1, 1985

Other Common Names: Aminobenzene; Phenylamine; Benzamine; Aminophen; Anilin-Oil; Kyanol

II Physical Chemical Properties

MP: -6°C (1) BP: 184°C (1) Solubility: 34,000 mg/L (1) VP: 0.3 mmHg at 20°C (1) S.G.: 1.02 (1)

$BOD_5$: 1.49-2.26 Standard dilution sewage. (1)

III Appearance and other properties Colourless oily liquid (2). Aniline darkens on exposure to air and light. (3)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: 0.90/0.98 (1) Threshold Odour: Bioaccumulation Factor: low based on aniline's solubility and partition coefficient.

Half-Life - Water: see *below Sediment: see ** below Fish:

Synergistic, Additive, Antagonistic Factors:

Toxicity Testing:

| Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 0.4 mg/L | Daphnia | 23°C | 48 hr. TLm | (4) |
| 279 mg/L | Daphnia magna | L.Erie 25°C | Threshold immobilization concentration | (4) |
| 134 mg/l | Fathead minnow | | 96 Hr. LC50 | (6) |
| 10.6 mg/l | Rainbow Trout | | 96 Hr. LC50 | (7) |

* Biodegrades readily. (5) Photo-oxidized by U.V. light in a aqueous medium at 50°C; 28.5% degradation to $CO_2$ after 24 hrs. (1)

** Aniline is decomposed by soil microflora in 4 days. (1)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other:

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Lowest published lethal dose in humans is 350 mg/kg (2) Half-Life:
Oral LD50 (rat):440 mg/kg (2)
Dermal LD50 (rat): 1400 mg/kg (2)
Dermal LD50 (guinea pig): 1290 mg/kg (2)

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action: The most important action of aniline on the body is the transformation of oxyhemoglobin, through the oxidation of $Fe^{2+}$ to $Fe^{3+}$, to methemoglobin. This results in the absence of oxygen in the arterial blood (anoxemia) and depression of the central nervous system. Some investigators believe that aniline may have a direct toxic action, resulting in the fall of blood pressure and irregularity in the heart beat (cardiac arrythemia). (2)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources Occurs in dye, varnish, rubber, chemical and gas-plant wastes. (4)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources:

Uses: Used in the manufacturing of dyes, medicinals, varnishes, perfumes and shoe blacks. Aniline is also used in the vulcanizing of rubber and as a solvent. (3)

OTHER INFORMATION

I Case Studies

REFERENCES


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5. U.S. Environmental Protection Agency. Oil and Hazardous Materials. Technical Assistance Data System. Oil and Special Materials Control Division, Office of Water Program Operations. Washington, D.C. 20460.

6. Brooke L.T., et al. Center for Lake Superior Environmental Studies University of Wisconsin-Superior. Acute Toxicity of Organic Chemicals To Fathead Minnows (Pimephales Promelas). 1984. Supported by the U.S. Environmental Protection Agency through cooperative Agreements 806864 and 809234.

7. F.S.H. Abram and I.R. Sims. The Toxicity of Aniline To Rainbow Trout. Water Res. Vol. 16, pp 1309, 1982.

IDENTIFICATION

I Name Benzene

Chem. Symbol: $C_6 H_6$ CAS #: 71-43-2 Date: May 18, 1984

Other Common Names: Benzol, coal naptha, cyclohexatriene, Phene, Phenyl hydride.

II Physical Chemical Properties

MP: 5.5 °C BP: 80.1 °C Solubility: 1.8 g/L at 25°C VP: 76 mmHg at 20°C (6) S.G.: 0.88 at 25°C (1)
60 mmHg at 15°C (6)

$BOD_5$:

III Appearance and other properties Volatile, clear, colourless, flammable liquid. Burns with a sooty, luminous flame. Belongs to the family of compounds known as aromatic hydrocarbons. (1)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Unidefined Tolerance Limits (Table 3) (2) Others: 3100 ug/l 24hr avg. never exceed 7000ug/L (U.S. EPA) (3)

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: A trace amount (0.05 to 0.1mg/L) identified in the St. Clair R. at Point Edward. None found in the river at Sombra. (4)
Sediment: None identified in any St. Clair R. sediments collected from 9 sites throughout the industrial area. (4)
Biological Organisms: Identified in a variety of St. Clair R. fish at concentrations up to 290 ug/kg (4)

III Biological Information

Partition Coef.: 1.95 to 2.13 (5) Threshold Odour: Bioaccumulation Factor: Probably Low (7)

Half-Life - Water: 5 hours (8) Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 34,420 ug/L | Goldfish | | 96-hr LC50 | (3) |
| 33,470 ug/L | Fathead Minnow | | 96-hr LC50 | |
| 32,000 ug/L | Guppy | | 96-hr LC50 | |
| 36,000 ug/L | Mosquito fish | | 96-hr LC50 | |
| 386,000 ug/L | Bluegill | | 96-hr LC50 | |

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other: U.S.EPA 0.66ug/L *. (10)

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: 5600-5700 mg/kg ($LD_{50}$) in rats Half-Life:

Mutagen: positive indicators**(9) Teratogen: Carcinogen: positive (6)

Mode of Toxic Action:** Mutagenicity: - bone marrow cell chromatid breaks (rat); chromasomal aberrations in lymphocyte cultures (human) (9)

Taste threshold in water: 0.5 mg/l (6)

*Based on the assumption that individuals would be drinking water and eating fish, etc. from a given water body. (10)

BENZENE (cont.)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources Petroleum refinery; solvent recovery plant; coal tar distillation; coal tar processing; coal coking, manufacturing of styrene, phenol, detergents, organic chemicals, pesticides, plastics and resins, synthetic rubber, aviation fuel, dye, explosives, pharmaceuticals, PCB's, gasoline, flavours and perfumes, paints and coatings, nylong intermediates, photographic chemicals; also used in food processing and in the tanning industry (9)

Amt. Produced: 470 Gg/annualy* (9)  Consumed:  Discharge: Air:  Water:  Land:

Other Sources:

Uses: Benzene is used as a solvent for industrial extraction and rectification and in the rubber industr
It is also used as a degreasing and cleaning agent. Also a component of gasoline (9)

* Gg = 1000 metric tonnes

OTHER INFORMATION

I Case Studies

REFERENCES


1) Ontario Ministry of the Environment Hazardous Contaminants Program. Environmental Aspects of Selected Aromatic Hydrocarbons in Ontario: A Comprehensive Background Report #HCP-1-7-8-1978.

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3) United States Environmental protection Agency. Ambient Water Quality Criteria: Benzene. EPA-440/5-80-018. Criteria and Standards Division, Environmental Protection Agency Washington DC 20460. 1980

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5) Chiou, C.T., Freud, V.H., Schmedding, D.W., and Kohnert, R.L. Partition Coefficients and Bioaccumulation of Selected Organic Chemicals. Environmental Science and Technology, 11(5): 475-478. 1977.

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7) United States Environmental Protection Agency. Water-related Fate of 129 Priority Pollutants. Vol. II. EPA-440/4-79-029. Office of Water Planning and standards. United States Environmental Protection Agency Washington, D.C. 20460. 1979

8) MacKay, D. and Leinonen P.J. Rate of Evaporization of Low - Solubility Contaminants from Water Bodies to the Atmosphere. Environmental Science and Technology 9(13): 1178-1180, 1975

9) Research Program on Hazard Priority Ranking of Manufactured Chemicals (Chemicals 21-40). Standford Research Institute, Menlo Park, California.

10) Canada, Department of the Environment and Ontario Ministry of the Environment. Environmental Baseline Report of the Niagara River. November, 1981 Update. Canada-Ontario Review Board. November 16, 1981.

SCIENTIFIC-ATION

I Name: Benzo(a)pyrene

Chem. Symbol: $C_{20}H_{12}$ CAS #: 50-32-8 Date: May 2, 1985

Other Common Names: 1,2-Benzopyrene; 3,4-Benzopyrene; BaP

II Physical Chemical Properties

MP: 179°C(1) BP: 311°C at 10 mmHg (1) Solubility: 0.0038 mg/L at 25°C (2) VP: 5 X $10^{-9}$mmHg(2) S.G.:

$BOD_5$:

III Appearance and other properties: Yellowish crystals. BAP is a five ring polycyclic aromatic hydrocarbon (PAH). (1)

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AQUATIC EFFECTS

I Objectives, Guidelines:

Water PWQO: Substance with Undefined Tolerance Limits (Table 3). (3) Others: see * below

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario:

Water:

Sediment:

Biological Organisms: 14 to 128 ug/kg in fish fillets from the Detroit River and Hamilton Harbour (4)

III Biological Information:

Partition Coef.: 6.04(2) Threshold Odour: Bioaccumulation Factor: see ** below

Half-Life - Water:

Synergistic, Additive, Antagonistic Factors

| Toxicity Testing; Concentration | Species | Test Water | Results |
|---|---|---|---|

* For a $10^{-6}$ lifetime cancer risk from the ingestion of PAH contaminated water and fish the ambient water concentration should not exceed 2.8 ng/L. For the same lifetime cancer risk from the ingestion of PAH contaminated fish only the ambient water concentration should not exceed 31.1 ng/L. (6)

** Although PAHs are rapidly accumulated, they are also rapidly metabolized and eliminated (excreted) from aquatic organisms. (2) However, aquatic organisms that do not possess a mixed function oxidase (MFO) enzyme system can act as bioaccumulators of PAHs (i.e. mussels, oysters and clams). (7).

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines:

Drinking Water: M.O.E. Other 0.01 ug/L (WHO) see Other Information Section (11)

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Half-Life:

Mutagen: positive in Salmonella/microsome test. (5) Teratogen: Carcinogen: animal positive*(6)

Mode of Toxic Action:

* There is no firm evidence that BaP alone is teratogenic, mutagenic, or carcinogenic in humans. However, mixtures of compounds which contain BaP as a constituent have been associated with cancer in man. (5) Although there has been some study of drinking water quality and cancer occurrence, there is no conclusive evidence that the presence of PAHs in drinking water is related to the incidence of cancer. (9)

The consumption of PAHs in food accounts for approximately 99% of daily intake. Drinking water is thought to account for approximately 0.1%, even when the source water is contaminated. The yearly intake of PAHs from food and drinking water is estimated in the range of 1 to 10 mg (0.003 to 0.027 mg/day), of which 0.1 to 1.0 mg (0.00027 to 0.00274 mg/day) is BaP. Exposure also occurs through inhalation of contaminated air. (9)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticides  Lab Specialist: Manager  Phone: 248-3846

Others:

II Detection Limits

Water: 0.1 ng/L (10)  Biological: *

Sediment: *  Other:

* Replicate analyses should be within 10% of the mean. (10)

I Industrial and Commercial Sources Coal tar processing; petroleum refining; shale refining; coal and coke processing; kerosene processing; heat and power generation.(1)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Combustion of tobacco; combustion of fuels; present in run-off containing greases, oils etc., potential roadbed and ashphalt leachate. (1) Atmospheric deposition.

Uses: none

Other Information

Guideline computed from a conservative, hypothetical, mathematical model that cannot be experimentally verified and therefore should be interpreted differently. Uncertainties involved are considerable and variations of two orders of magnitude (i.e., from 0.1 to 10 times the number) could exist.

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3. Ontario Ministry of the Environment. Water Management, Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment. Water Resources Branch, Ontario Ministry of the Environment, 135 St. Clair Ave. W. Toronto, Ontario. 1978.
4. Report to the Great Lakes Water Quality Board/Great Lakes Science Advisory Board. 1981 Annual Report, Committee on the Assessment of Human Health Effects of Great Lakes Water Quality. November, 1981.
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10. Ontario Ministry of the Environment. Outlines of Analytical Methods. Coordinated by Water Quality Section. Labratory Services Branch. Ontario Ministry of the Environment. P.O. Box 213, Rexdale, Ont. 1981.
11. World Health Organization. Guidelines For Drinking - Water Quality. Volume 1 Recommendations. 1984. ISBN 92 4 154168 7.

IDENTIFICATION

I Name Benzothiazole

Chem. Symbol: $C_7 H_5 NS$ CAS No.: 95-16-9 Date: May 18, 1984

Other Common Names: Benzosulfonazole 1-thia-3-azaindene, O-2857, Vangard B.T., USAF EK-4812 (1)

II Physical Chemical Properties

MP: 2 °C BP: 227-228 °C Solubility: slightly sol in $H_2O$. Very sol. alcohol carbon disulphide VP: S.G.: 1.246 @ 20°C

$BOD_5$:

III Appearance and other properties Liquid at standard temperature pressure. (1)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: 24-hr. compsite-8.9 ug/L Elmira sewage treatment plant effluent. (4)

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: 2.01-2.03 Threshold Odour: 0.08 mg/L (1) Similar to quinoline Bioaccumulation Factor:

Half-Life - Water: Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

Toxicity Testing: Concentration Species Test Water Results

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other:

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: LD-50 I.V. mice 100 mg/kg (1) Half-Life:

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action:

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants Analyse by gas chromatography — Lab Specialist: Manager — Phone: 248-3512

Others:

II Detection Limits

Water: — Biological: — Air:

Sediment: — Other:

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced: — Consumed: — Discharge: Air: — Water: — Land:

Other Sources: Occurs naturally in heat treated chocolate, peanuts, filberts, beef, popcorn coffee, milk (2) There is some suggestion that benzothiazole identified in foods occurs as the result of contamination from the sampling and analytical equipment.

Uses: Rubber accelerator, flavoring ingredient at 0.5 ppm. Antimicrobial to control athletes foot infect[illegible].

OTHER INFORMATION

I Case Studies

REFERENCES

1) Windholz, M.ed. The Merck Index: An Encyclopedia of Chemicals and Drugs. Merck and Company, Inc., Rahway New Jersey, 1976.

2) Fenaroli. Handbook of Flavoring Ingredients 2nd Edition. Vol 2:44.

3) Fenaroli. Handbook of Flavouring Ingredients 2nd. Edition. Vol. 1:229.

4) Ontario Ministry of the Environment. Unpublished Report: Trace Contaminants in the Grand River Basin. Water Resources Branch, Ontario Ministry of the Environment, 135 St. Clair Avenue West, Toronto, Ontario. 1981.

IDENTIFICATION

I Name Bis (2-chloroisopropyl) Ether

Chem. Symbol: $ClCH_2CH_2OCH_2CH_2Cl$ CAS #: 108-60-1 Date: May 18, 1984

Other Common Names: Dichloroisopropyl Ether, 2,2-Dichloroisopropyl Ether Beta, Beta-Dichlorodiisopropyl Ether Beta, Beta-Dichlorodiisopropyl Ether, Bis(Beta - Chloroisopropyl) Ether DCIP, BCIE, (2-chloro-1-methylethyl) Ether. (1)

II Physical Chemical Properties

MP: -50°C (1) BP: 178°C (1) Solubility: 10,200 mg/L (1) VP: 0.85 mmHg at 20°C S.G.: 1.22 at 20°C (2)

$BOD_5$:

III Appearance and other properties clear, colorless liquid at room temp. (2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: Detected in trace amounts (0.05 to 0.10 ug/L) in industrial effluents entering St. Clair R. (3)

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: 2.58 (4) Threshold Odour: 0.32 mg/L (1) Bioaccumulation Factor: Probably Low (5)

Half-Life - Water: 1.37 days (6) Sediment: Fish: 4-7 days (2)

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results |
|---|---|---|---|

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other: 34.7 ug/L EPA* (2)

Fish Consumption: Aquatic organisms can accumulate DCBs to unacceptable levels for human consumptions (of the organisms) at a concentration of 4.36 mg/L in water. (2)
Approx. conc. causing adverse taste in fish: 1.0mg/L (1)

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Single Oral $LD_{50}$ (rabbit): 126 mg/kg (1)
Single Oral $LD_{50}$ (rat): 75-105 mg/kg (1)
Single Oral $LD_{50}$ (mouse): 136 mg/kg (1)

Half-Life:

Mutagen: Mice- no mutations (3) Teratogen: Carcinogen: No carcinogenic activity. (3)

Effects of Exposure: Short term: Pulmonary edema, liver diseases and necrosis. There is very little substantial information upon which to judge the environmental significance of bis (2-chloroisopropyl) ether.

* Based on the assumption that individuals would be drinking water and eating fish, etc. from a given water body.

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits Analysis by gas chromatography and mass spectrometry.

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources:

Uses: Found in waste water from the manufacture of glycol products, rubber and insecticides. It is an intermediate in the manufacture of dyes, resins and pharmaceuticals. Solvent extractant for waxes and grease. Agent in paint and varnish removers. (6)

OTHER INFORMATION

I Case Studies

REFERENCES

1) Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals.Second Edition Van Nostrand Reinhold Company. Toronto. 1983.

2) United States Environmental Protection Agency. Ambient Water Quality Criteria for chloroalkyl Ethers. EPA-44015-80-030 Criteria and Standards Division. United States Environmental Protection Agency. Washington, D.C. 20460. 1980.

3) Ontario Ministry of the Environment. St. Clair River Organics Study, Identification and Quantification of Organic Compounds. Ontario Ministry of the Environment, 135 St. Clair Avenue West, Toronto, Ontario

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5) Metcalfe, R. L. and J. R. Sanborn. Pesticides and Environmental Quality in Illinois. Illinois Natural History Survey Bull., 31:381-436. 1975.

6) United States Environmental Protection Agency. Investigation of Selected Potential Environmental Contaminants: Haloethers. U.S. Environmental Protection Agency, Office of Toxic Substances, Washington, D.C. 20460. 1975.

7) United States Environmental Protection Agency. Water Related Fate of 129 Priority Pollutants, Vol. II. E.P.A. 4404/4-79-0296. United States Environmental Protection Agency, Office of Toxic Substances, Washington. 20460 D.C.

IDENTIFICATION

Name Bis(2-Ethylhexyl)Phthalate

Chem. Symbol: $C_6 H_4 (COOC_8 H_{17})_2$ CAS No.: 117-81-7 Date: May 18, 1984

Other Common Names: Dioctylphthalate; di(2-ethylhexyl)phthalate; DOP; DEHP; Octoil; 1,2-Benzenedicarboxylic acid bis(2-ethylhexl)ester.

II Physical Chemical Properties

MP: -55°C (1) BP: 385°C (1) Solubility: 0.285 mg/L at 24°C (Tech. grade) (1) (2) VP: $1.6 \times 10^{-7}$ mmHg(1) 1.2mmHg at 200°C S.G.: 0.99 at 20°C(1)

$BOD_5$:

III Appearance and other properties Light coloured liquid. Miscible with most common solvents. (4)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 0.6 ug/L (unfiltered) (5) Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: 0.05 to 9.0 ug/L range of phthalates in drinking water from some areas in Ontario (tests conducted in the early 1970's) self contaminating drinking water treatment systems. (6)
Sediment: 0.7 ug/kg Nipigon Bay, Lake Superior (1977) (7)

Biological Organisms: DEHP was detected in whole fish samples of burbot from Goderich, Lake Huron in the concentration range of 0.01 to 0.1 ug/g (tests conducted in the early 1970's). (7)

III Biological Information

Partition Coef.: 3-4 (3) Threshold Odour: Bioaccumulation Factor: see bioconcentration*

Half-Life - Water: 5 days **(2) Sediment: see *** below Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: | Concentration | Species | Test Water | Results | |
|---|---|---|---|---|---|
| | 1.110 mg/L | Daphnia magna | | LC-50 | (4) |
| approx. | 500-900 mg/L | Rainbow trout | | computed 96hr LC-50 | (3) |
| | 7700 mg/L | Bluegill | undissolved chemical | 24hr LC-50 | (3) |

*Bioconcentration Factors: Scud 54-2,680 and Fathead minnows 155-886. Invertebrates accumulate higher concentrations of phthalate esters than do fish. This suggests that biodegradation is either very slow or non-existent in invertebrates. Since fish are capable of degrading phthalate esters these chemicals are not expected to biomagnify greatly along the food chain. (3)
**Disappears in 15 days with degradation resulting in phthalic acid build up through half-acid ester form. (2)
***Aerobic degradation in freshwater mud (hydrosoil); 50% after 14 days in incubation. (1)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other: Not specified (Health and Welfare Canada)*

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Oral LD50 26g/kg in rats. (4)
Dermal LD50 10g/kg in guinea pigs. (4)
Half-Life: Short in humans and rats. (4)

Mutagen: positive in rats at high concentrations (2) Teratogen: positive (rat)** (4) Carcinogen: negative (9)

Mode of Toxic Action:
Human Exposure: A 5g dose of DEHP produced no detectable effects; a 10g dose resulted in diarrhea. (8)

*The highest concentration of phthalates detected in Canadian drinking water is 0.009 mg/L. This concentration is well below the levels which produce toxic effects in humans. A maximum acceptable concentration for drinking water has, therefore, not been specified. Since some of these compounds have been shown to be mutagenic in animals, further research on the effects of low level, long term ingestion of phthalates is desirable. (8)
**Since the quantity of phthalate esters ingested by humans on a daily basis is extremely small as compared to doses used in teratogenicity studies, it seems remote that teratogenic effects would be produced in humans. However, it is suggested that further studies be carried out to verify this assumption. (4)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources Effluents from PVC manufacturing plants, textile plants and paper mills.(9)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Loss of phthalates from products during their useful lifetimes; and disposal of phthalate ester-containing products via incineration and landfill. (3)

Uses: Because they can impart flexibility to resins, phthalate esters are estensively used as plasticizers in the fabrication of various plastics, especially polyvinyl chloride (PVC). Other uses are in insect repellent formulations, cosmetics, rubbing alcohol, liquid soap, detergents, decorative inks, lacquers, munitions, industrial and lubricating oils, defoaming agents during paper and paperboard manufactoring and as pesticide carriers. (3)
Bis(2-ethylhexyl)phthalate is the most widely used phthalate plasticizer in Canada. (3)

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I Case Studies

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IDENTIFICATION

I Name Carbon Tetrachloride

Chem. Symbol: $CCl_4$ CAS No.: 56-23-5 Date: May 2, 1985

Other Common Names: Tetrachloromethane; Perchloromthane; Carbon chloride; Tetraform; Necatorina; Freon-10 (1)

II Physical Chemical Properties

MP: -23°C (6) BP: 76.7 °C (6) Solubility: 1,160 mg/L at 25°C (6) VP: 90 mmHg at 20°C (6); 56 mmHg at 15°C (6); 113 mmHg at 25°C (6) S.G.: 1.59 (1)

$BOD_5$:

III Appearance and other properties Clear, colorless, heavy, volatile, mobile, non-flammable, liquid, with a sweet, non-irritating odor. (1)
Photolysis in the upper atmosphere converts $CCl_4$ to phosgene gas. (2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Undefined tolerance limit (3) Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: 90 ug/L St. Clair R. water (4)

Sediment: Identified in St. Clair R. Sediment. (4)

Biological Organisms: Identified in St. Clair R. fish. (4)

III Biological Information

Partition Coef.: 2.73 (5) Threshold Odour: 50 mg/L(6) Bioaccumulation Factor: Low. Bluegills: 30 Rainbow trout: 17 (7)

Half-Life - Water: 29 min.*(8) Sediment: Fish: less than 1 day (5)

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results |
|---|---|---|---|
| 35,200 ug/L | Daphnia magna | - | 48-hr. EC-50 |
| 125,000 ug/L | Bluegill | - | 96-hr. LC-50 |
| 27,300 ug/L | Bluegill | - | 96-hr. LC-50 |
| 3,400 ug/L | Fathead minnow | - | Embryo-larval test: no adverse effect duration not stated |
| 43,100 ug/L | Fathead minnow | - | 96-hr. LC-50. Flow-through test, measured concentrations (2) |

*Major route of loss from water is evaporation. (8)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other: 3ug/l (WHO tentative) (11)

Fish Consumption: Aquatic organisms can accumalate carbon tetrachloride to unacceptable levels for human consumption (of fish) at concentrations of 6.94ug/L U.S.EPA. (2)

Tolerance Limits in Other Foodstuffs: Measured concentrations in a variety of foods range from 0.2 ug/kg to 20 ug/kg. Maximum permitted in cooked cereals, 50 ug/kg. (10)

II Effects

Acute Toxicity: Oral LD50 (rat): 2.92 mg/kg (6) Half Life:

Mutagen: No mutagenic potential (10) Teratogen: Teratogenic potential not established (10) Carcinogen: Carcinogenic activity in rats, mice, hamsters. (10)

Mode of Toxic Action:

Acute Exposure: Nausea, vomiting, diarrhea, headache, stupor, renal damage. Can be fatal. (10)
Chronic Exposure: Primarily liver damage, kidney injury and visual disturbances also occur. (10)

CARBON TETRACHLORIDE CON'T

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced: 50 Gg/yr* (9) Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Quantified up to 900 ug/L in St. Clair R. effluents. (4)

Uses: Dry cleaning, metal de-greasing and cleaning, aerosols and propellants fumigants, manufacture of chlorofluoromethanes. (6)

* Gg = 1000 metric tonnes

OTHER INFORMATION

I Case Studies

REFERENCES


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10) National Academy of Sciences. Drinking Water and Health. Safe Drinking Water Committee, National Academy of Sciences, 2101 Constitution Ave., Washington, D.C. 20418. 1977.

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IDENTIFICATION

I Name Chloroform

Chem. Symbol: $CHCl_3$ CAS #: 67-66-3 Date: May 18, 1984

Other Common Names: Trichloromethane, Freon 20, Trichloroform

II Physical Chemical Properties

MP: -64°C (5) BP: 62°C (5) Solubility: 10,000 mg/L at 15°C (5)
8,000 mg/L at 20°C (5)
9,300 mg/L at 20°C (5)
VP: 160 mmHg at 20°C S.G.: 1.489 at 20°C

$BOD_5$: 0.0008 mg/L (5)

III Appearance and other properties Clear, colourless, non-flammable, volatile liquid. Sweet ethereal odour. (1)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Unidentified Tolerance Limit (Table 3) (2) Others: 500 ug/l 24hr avg. never exceed 1200 ug/l(1)

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: St. Clair R. at Pt. Edward: found in one water sample at a concentration of 0.01 ug/l.
A trace amount (0.05 to 0.1 ug/l) was identified in river water at Sombra. (3)
Sediment: Chloroform has been identified in St. Clair R. sediments adjacent to Dow Chemical of Canada.(3)

Biological Organisms: Chloroform has been identified in St. Clair R. emerald shiners. Not detected in five other species (3)

III Biological Information

Partition Coef.: 1.97 (4) Threshold Odour: 20 mg/l (5) Bioaccumulation Factor: weak to moderate (6)

Half-Life - Water: 21 ± 4 minutes, also see * below (7) Sediment:

Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results |
|---|---|---|---|
| 36,500 ug/l | Rainbow trout | Static test | 96-hr. LC50 (1) |
| 23,900 ug/l | Rainbow trout | Static test | 96-hr. LC50 |
| 62,900 ug/l | Bluegill Sunfish | Static test | 96-hr. LC50 |
| 54,700 ug/l | Bluegill Sunfish | Static test | 96-hr. LC50 |
| 185,000 ug/l | Microcystis aeruginosa | - | inhibition of cell division (5) |

*measured half-life for a 1 ppm solution, still air and an average depth of 6.5 cm.: 34.5 mins. at 1-2°C (5)
: 18.5-25.7 mins. at 25°C (5)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.:0.35 mg/l (total trichloromethane)(9) Other: 30ug/l WHO (see Other Information Section) (10)

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: 1800 mg/kg (LD50) in male mice (6)
1900 mg/kg (LD50) in female mice (6)
Half-Life:

Mutagen: Teratogen: Carcinogen: positive (1)

Mode of Toxic Action: Liver toxicant. Central nervous system depressant. (6)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources Imported to Canada. 1976: 2.77 Gg*(6). Used by DuPont of Canada, Maitland; Allied Chemical, Amberstburg and Dow Chemical Sarnia. . Chloroform is not manufactured in Ontario. (6)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources:

Uses: The most important use is as a starting point in the manufacture of chlorodifluoromethane. (6)

Gg = 1000 metric tonnes

OTHER INFORMATION

Guideline computed from a conservative, hypothetical, mathematical model that cannot be experimentally verified and therefore should be interpreted differently. Uncertainties involved are considerable and variations of two orders of magnitude (i.e., from 0.1 to 10 times the number) could exist.

INFORMATION

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10) World Health Organization. Guidelines For Drinking - Water Quality. Volume 1 Recommendations. 1984. ISBN 92 4 154168 7.

# ENVIRONMENTAL FACTS ON CHLORINATED PHENOLS

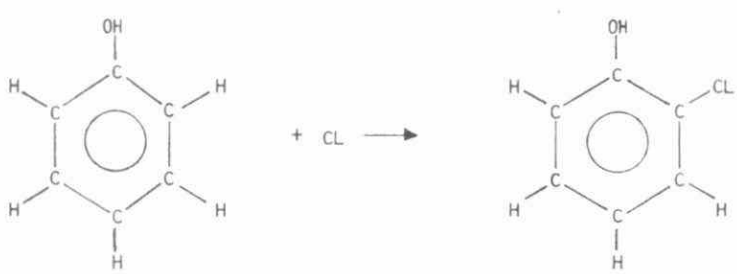
The chlorophenols (CPs) represent a group of compounds that are derived from phenol by substituting chlorine atoms for hydrogen atoms bound to carbon atoms. Of the 19 CP isomers only eight are of commercial importance: o-chlorophenol (2-CP); p-chlorophenol (4-CP); m-Chlorophenol (3-CP) (limited commercial use) 2,4-dichlorophenol (2,4-DCP); 2,4,5-trichlorophenol (2,4,5-TCP); 2,4,6-trichlorophenol (2,4,6-TCP); 2,3,4,6-tetrachlorophenol (2,3,4,6-TTCP); pentachlorophenol (PCP).

Chlorphenols are commercially important as biocides, broad spectrum pesticides, and as chemical intermediates. They are used as perservatives in woods, paints, photographic solutions, hides and leathers, and textiles; and as antimicrobials in industrial cooling systems. In agriculture CPs are used as pesticides and herbicides. They are used also as chemical intermediates in the synthesis of dyes, pigments, phenolic resins, pesticides and herbicides. Another use of CPs is in gasoline as an antigumming agent.

Since the chlorophenols have such a variety of uses their release into the environment is inevitable. These chemicals may enter the environment in industrial and municipal effluents, through agricultural application, and from the disposal of wastes containing chlorinated phenols. Another source of CPs to the environment is through the inadvertent production of these chemical compounds by chlorination reactions which take place during the disinfection of drinking water or waste water effluents.

## NOMENCLATURE OF CP's

The substitution of a chlorine atom for a hydrogen atom on a phenol molecule results in the formation of a chlorinated phenol (see Fig. 1).




Phenol Chlorophenol

Figure 1

The number of chlorine atoms that are substituted onto the phenol molecule is indicated by the following prefixes:

one chlorine - monochlorophenol (chlorophenol)
two chlorines - dichlorophenol
three chlorines - trichlorophenol
four chlorines - tetrachlorophenol
five chlorines - pentachlorophenol

In naming the specific CP isomers, the carbon atom positions around the phenol molecule are numbered. The numbering starts at the carbon atom that the hydroxyl radical is attached to because it is the functional chemical of the parent compound (see Fig. 2a). The chlorine atom positions are then indicated in relation to the hydroxyl radical (see Fig. 2b,c and d).

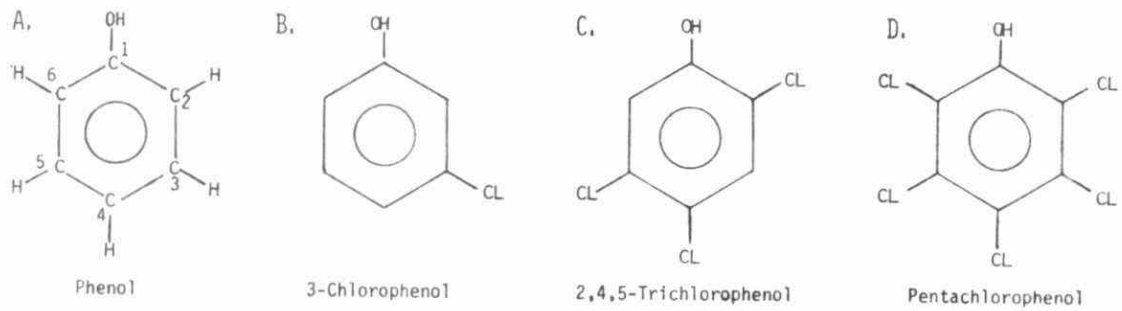



Figure 2

## AQUATIC TOXICITY

Chlorophenols have been shown to be highly toxic to aquatic life. In most cases aquatic plants are less sensitive to the toxic effects of CPs than aquatic animals. The toxicity of the chlorophenols depends on the nature and degree of chlorine substitution. In general, the toxicity increases with increasing chlorine substitutions. The toxicity of CPs also decreases with increasing pH. For toxicity values of CPs to aquatic plants and acute toxicity to bluegill sunfish see Table 1 and Figure 3.

## ENVIRONMENTAL DISTRIBUTION AND FATE

### Volatilization

The volatilization of chlorophenols from surface waters to the atmosphere is not considered an important distribution process.

## Bioaccumulation

The bioconcentration factors (BCFs) for the lower chlorinated phenols have been calculated using their log P values (logrithm of the octanol/water partition coefficient). The calculated BCFs show that the lower chlorinated phenols would not accumulate to high concentrations in aquatic life forms. The measured and calculated BCF values for the higher chlorinated phenols indicate they would bioaccumulate in aquatic biota at much higher levels than the lower chlorinated phenols.

## Sorption

The log P values of the different chlorophenols indicates that the higher chlorinated phenols tend to associate more with sediments and particulate matter in surface waters than the lower chlorinated phenols. Sorption is an important distribution process for the higher chlorinated CPs.

## Photolysis

Information on the photodegradation of the chlorinated phenols indicates these chemicals can be broken down by photolysis. The environmental importance of this process is insignificant or unknown for the mono, di, tri and tetrachlorophenols. In the case of pentachlorphenol photolysis may be important in neutral to alkaline waters particularly if these waters are clear and shallow.

## Biodegradation

Microbial degradation appears to be the main environmental fate of the DCPs, TCPs, TTCPs and PCP. Biodegradation of the MCPs has been documented in labratory studies, but the rate of this process in the environment is unknown. The available data shows that the lower chlorinated phenols are biologically degraded at faster rates than the higher clorinated phenols.

For a summary of the aquatic fate and distribution processes of the chlorophenol isomers see Table 2.

TABLE 1: TOXICITY OF CHLORINATED PHENOLS TO FRESHWATER PLANT LIFE

| CP Name | Concentration | Organism | Results |
|---|---|---|---|
| Monochlorophenols | 500,000 ppm | Chlorella pyrenoidosa (Alga) | complete destruction of chlorophyll |
| 2,4,5 and 2,4,6-TCP | 10,000 ppm | Chlorella pyrenoidosa (Alga) | complete destruction of chlorophyll |
| 2,3,4,6-TTCP | 603 ppm | Lema minor (Duckweed) | Chlorosis (LC50) |
| PCP | 2.66 ppm | Macrocystis pyrifera (Kelp) | eliminated all photo-synthesis in 4 days |

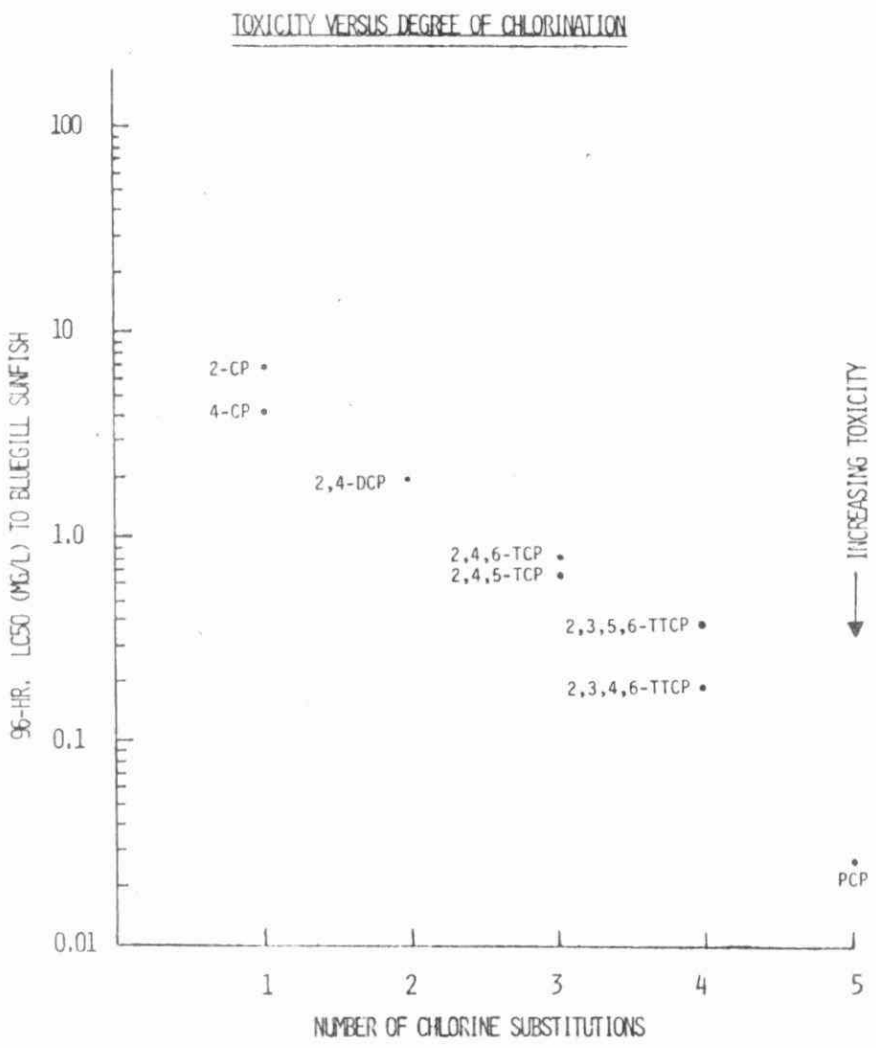



Figure 3

TABLE 2: SUMMARY OF AQUATIC FATE OF CHLOROPHENOLS

| Environment Process | Monochlorophenols | 2,4-Dichlorophenol | Trichlorophenols | Tetrachlorophenols | Pentachlorophenol |
|---|---|---|---|---|---|
| Photolysis (t 1/2) | demonstrated in labratory; environmental significance unknown | probably insignificant in natural waters | process has been reported; environmental relevance unknown | process has been reported; environmental relevance unknown | hours to days in 1 meter of water; weeks to months in other conditions |
| Volatilization (t 1/2) | probably of low significance | insignificant in natural waters | insignificant in natural waters | insignificant in natural waters | At 23$^{o}$C; 6.3 days at pH 4, 130 days at pH 6 |
| Biodegradation (t 1/2) | 1-26 days in lab. study rate in the environment uncertain | About 6 days, longer in anaerobic water | 70% degradation of 2,4,5-TCP in 35 days; 70% degradation of 2,4,6-TCP in 9-18 days in stagnant water | 3.5 months (1/2-life) | variable in lab studies but generally 100 days |
| Bioaccumulation (BCFs) | 7-70 times (calculated) 214 Bluegill (measured) | 39-67 based on log P of 2.92 | 170-1,900 fish (2,4,5-TCP) 51-4,420 plants (2,4,6-TCP) 115-12,180 fish (2,4,6-TCP) 3,000 invert. (2,4,6-TCP) uptake rates rapid to moderate (hours to days) | 330-609 fish (calculated) 20-221 fish muscle | 10 to 6000 fish (measured) 1250 algae (calculated) |
| Sorption | have some tendency to associate with particulates (based on log P) | may be of importance in organic particulates | probably important based on log P values and sediment enrichment in Rhine R. and and Finnish lakes | probably important based on log P values and sediment enrichment in in Rhine R. and Finnish lakes | important based on log P (undissociated PCP); more favoured under acidic conditions |

## HUMAN HEALTH EFFECTS

All of the chlorophenols are toxic to mammalian life forms. The mode of toxic action of these chemicals is the uncoupling of oxidative phosphorylation (disruption of energy production within cells). Dermal contact with the chlorophenols can cause skin irritation, reddening and swelling. Inhalation of the higher chlorinated phenols results in respiratory tract irritation and swelling. Based on available information, the only two chlorophenols of genotoxic concern are 2,4,6-TCP and PCP. 2,4,6-TCP has been shown to cause cancer in rats and PCP is a suspected animal teratogen.

## IMPURITIES

Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans are impurities which may occur in the higher chlorinated phenols. The highly toxic dioxin isomer, 2,3,7,8-TCDD has been found only in 2,4,5-TCP formulations. The toxic effects of these impurties may be wrongly attributed to those chlorinated phenolic compounds in which they occur, thereby giving a falsified increase of a chlorophenol's toxicity.

This information sheet was prepared to give a general overview of some environmental and biological data on chlorinated phenols. For information on a specific chlorophenol isomer please refer to the individual contaminant sheets.

IDENTIFICATION

I Name o-Cresol

Chem. Symbol: $CH_3 C_6 H_4 OH$ CAS No.: 95-48-7 Date: May 18, 1984

Other Common Names: ortho-Cresol; o-Cresylic Acid; 2-Hydroxytoluene; 2-Methyl Phenol; 2-Cresol.

II Physical Chemical Properties

MP: 31°C (1) BP: 191°C (1) Solubility: 31,000 mg/L at 40°C (1) VP: 0.24 mmHg at 25°C (1)

S.G.: 1.041 (1) $BOD_5$: 1.6-1.7 standard dilution sewage. (1)

III Appearance and other properties Yellowish liquid with a phenolic odour. (2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Substance with undefined tolerance Limit (Table 3) (3) Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: Threshold Odour: 0.09 to 0.65 ppm (1) Bioaccumulation Factor:

Half-Life - Water: see * below Sediment: see ** below Fish:

Synergistic, Additive, Antagonistic Factors: Low oxygen content in water and sublethal concentrations of 1,2,6-xylenol increase the toxicity of o-cresol. (4)

| Toxicity Testing: Concentration | | Species | Test Water | Results | |
|---|---|---|---|---|---|
| 23 | mg/L | Bluegill sunfish | 25°C | 48hr. TLm | (4) |
| 29 | mg/L | Carp | 25°C | 24hr. TLm | (4) |
| 13.4 | mg/L | Fathead Minnow | 25°C | 48-96hr TLm | (4) |
| 2.3 | mg/L | Salmonide Embryo | 17°C | 24hr. TLm | (4) |

* Biodegrades at a moderate rate. (4)

** No information on sediments was available. However, o-cresol is decomposed by soil microflora in one day. (1)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: 0.002 mg/L as (total phenols) see * below (5) Other:

Fish Consumption: see ** below

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Oral LD50 1350 mg/kg in rats (4) Half-Life:
Dermal LD50 1782 mg/kg in rabbits (4)

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action:

Effects of Exposure: o-Cresol is toxic via all routes. Dermal contact may cause skin eruptions. o-Cresol is corrosive to body tissues and adsorption may lead to liver and kidney damage. (4)

* Lowest concentration causing taste in chlorinated water is 0.0001 mg/L. (6) Taste threshold concentration drops greatly with chlorination. (4) Taste threshold: 0.003 mg/L (1)

** The concentration of cresols in water causing tainting of fish flesh is 10 mg/L. (7)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticides  Lab Specialist: Manager  Phone: 248-3846

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources Coal tar refining; petroleum refining; organic chemical manufacturing; wood processing. (1)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Automobile exhaust, runoff from ashphalt, petroleum distillates, fuels, oils, lubricants, metal cleaning and scouring compounds, constituent of coal, wood and domestic sewage, also general use of plastics. (1)

Uses: o-Cresol is used in the manufacturing of dyes, perfume, plastics, resins, tricresylphosphate, coumarin and salicyldehyde. o-Cresol is also used in disinfectants, food antioxidants, ore flotation and used as a surfactant, textile scouring agent and organic intermediate. (1)

OTHER INFORMATION

I Case Studies

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IDENTIFICATION

I Name m-Cresol

Chem. Symbol: $CH_3 C_6 H_4 OH$ CAS No.: 108-39-4 Date: May 18, 1984

Other Common Names: m-Methyl phenol; 3-Methyl phenol; m-Cresylic acid; 3-Hydroxytoluene; meta-Cresol; 3-Cresol.

II Physical Chemical Properties

MP: 12°C (1) BP. 202°C (1) Solubility: 23,500 mg/L at 20°C (1) VP: 0.04 mmHg at 20°C (1) 0.12 mmHg at 30°C

S.G.: 1.038 at 20 to 24°C (1) $BOD_5$: 1.7 Std. dil sew. (1)

III Appearance and other properties Yellowish liquid with a phenolic odour. (2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Substance with undefined tolerance limit (Table 3). (3) Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: Threshold Odour: 0.016-4.0 mg/L (1) Bioaccumulation Factor:

Half-Life - Water: see * below Sediment: see ** below Fish:

Synergistic, Additive, Antagonistic Factors: Low oxygen content in water and sublethal concentrations of 1,2,6-xylenol increase the toxicity of m-cresol. (4)

| Toxicity Testing: Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 10 mg/L | Bluegill sunfish | distilled | 96hr TLm | (4) |
| 24 mg/L | Mosquito fish | pond | 48hr TLm | (4) |
| 6.5 mg/L | Salmonide embryo | | 24hr TLm | (4) |
| 24.5 mg/L | Carp | | 24hr TLm | (4) |

* Biodegrades at a moderate rate.

** No information on sediments was available. However, m-cresol is decomposed by soil microflora in one day (1)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: 0.002 mg/L as total phenols see * below(5) Other:

Fish Consumption: see ** below

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Oral LD50 2020 mg/kg in rats (6) Half-Life:
Dermal LD50 620 mg/kg in rats (2)

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action:

Effects of Exposure: m-Cresol is toxic via all routes. Dermal contact may cause skin eruptions. m-Cresol is corrosive to body tissues and adsorption may lead to liver and kidney damage. (4)

* Lowest concentration causing taste in chlorinated water is 0.0020 mg/L. (7) Taste threshold concentration drops greatly with chlorination. (4) Taste threshold: 0.002 mg/L (1)

** The approx. concentration of cresols in water causing tainting of fish flesh ranges from 0.2 mg/L to 10 mg/L (1)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticides  Lab Specialist: Manager  Phone: 248-3846

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Ortho- and para-cresols have been found in cigarette smoke. Exposure to these chemicals, therefore, increases with the number of cigarettes smoked. (8)

Uses: Used in disinfectants, fumigants, photographic developers and explosives. (6)

OTHER INFORMATION

I Case Studies

REFERENCES


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4. U.S. Environmental Protection Agency. Oil and Hazardous Materials - Technical Assistance Data System. Oil and Special Materials Control Division, Office of Water Program Operations. Washington, D.C. 20460.
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9. U.S. Department of the Interior, Federal Water Pollution Control Administration. Water Quality Criteria. Report of the National Technical Advisory Committee to the Secretary of the Interior. April 1, 1968. Washington, D.C.

IDENTIFICATION

I Name p-Cresol

Chem. Symbol: $CH_3 C_6 H_4 OH$ CAS No.: 106-44-5 Date: May 18, 1984

Other Common Names: para-Cresol; p-Methyl phenol; 4-Methyl phenol; p-Cresylic acid; 4-Hydroxytoluene; 4-Cresol

II Physical Chemical Properties

MP: 34.8°C (1) BP: 202°C (1) Solubility: 24,000 mg/L at 40°C (1) VP: 0.04 mmHg at 20°C (1)
0.11 mmHg at 25°C (1)

S.G.: 1.0347 at 20-24°C $BOD_5$: 1.4 to 1.76 standard dilution acclimated sewage. (1)

III Appearance and other properties Yellowish liquid with a phenolic odour. (2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Substance with undefined tolerance limit (Table 3) (3) Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: Threshold Odour: 0.055 ppm. (1) Bioaccumulation Factor:

Half-Life - Water: see * below Sediment: see ** below Fish:

Synergistic, Additive, Antagonistic Factors: Low oxygen content in water and sublethal concentrations of 1,2,6-xylenol increase the toxicity of p-cresol. (4)

| Toxicity Testing: Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 4 mg/L | Trout embryos | 17°C | 24hr TLm | (4) |
| 10 mg/L | Bluegill sunfish | Distilled | 96hr TLm | (4) |
| 24 mg/L | Mosquito fish | Pond | 48hr TLm | (4) |

* Biodegrades at a moderate rate. (4)
** No information on sediments was available. However, p-cresol is decomposed by soil microflora in one day (1)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: 0.002 mg/L as total phenols see * below (5) Other:

Fish Consumption: see ** below

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Oral LD50 1800 mg/kg in rats. (6) Half-Life:
Oral LD50 1100 mg/kg in rabbits (1)
Dermal LD50 750 mg/kg in rats (2)

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action:

Effects of Exposure: p-Cresol is toxic via all routes. Dermal contact may cause skin eruptions. p-Cresol is corrosive to body tissues and adsorption may lead to liver and kidney damage. (4)

* Lowest concentration causing taste in chlorinated water is 0.0010 mg/L. (7) Taste threshold concentration drops greatly with chlorination. (4) Taste threshold: 0.002 mg/L (1)

** The concentration of cresols in water causing tainting of fish flesh is 10 mg/L. (9)

P-CRESOL (cont.)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticides  Lab Specialist: Manager  Phone: 248-3846

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Sewage effluents. (1) Ortho- and para-cresols have been found in cigarette smoke. Exposure to these chemicals, therefore, increases with the number of cigarettes smoked. (8)

Uses: Used in resins, solvents and metal cleaning. (4)

OTHER INFORMATION

Humans are exposed to phenols produced in the gastrointestinal tract. The exposure is proportional to the amount of protein consumed and generally ranges between 50 and 100 mg of phenols, p-cresol, and phenol per day. This amount constitutes the most significant exposure of phenols by humans. (8)

REFERENCES


1. Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals.Second Edition Van Nostrand Reinhold Company. Toronto. 1983.
2. N. Irving Sax. Dangerous Properties of Industrial Materials. Fifth Edition. Van Norstrand Reinhold Company.
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4. U.S. Environmental Protection Agency. Oil and Hazardous Materials - Technical Assistance Data System. Oil and Special Materials Control Division, Office of Water Program Operations. Washington, D.C. 20460.
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9. U.S. Department of the Interior, Federal Water Pollution Control Administration. Water Quality Criteria. Report of the National Technical Advisory Committee to the Secretary of the Interior. April 1, 1968. Washington, D.C.

IDENTIFICATION

I Name 1,2-Dichlorobenzene

Chem. Symbol: $C_6 H_4 Cl_2$ CAS No.: 95-50-1 Date: May 2, 1985

Other Common Names: o-Dichlorobenzene; ortho-dichlorobenzene; 1,2-DCB.

II Physical Chemical Properties

MP: -16.7 to -18°C BP: 179°C Solubility: 100 mg/L at 20°C, 146 mg/L at 25°C VP: 1mmHg at 20°C, 1.5mmHg at 25°C S.G.: 1.305 at 20-24°C (1)

$BOD_5$:

III Appearance and other properties Colourless liquid. (1)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 2.5 ug/L (interim) (2) Others: see Fish Consumption

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: Detected at concentrations of 0.1 ppb (total DCBs) in raw water and 0.001 ppb (total DCBs) in treated water (1980) from Niagara-on-the-Lake, lower Niagara R. (3)

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: 3.38 (4) Threshold Odour: 10ug/l (1), 3ug/l (11) Bioaccumulation Factor: Low in the lipids of of living organisms (4)

Half-Life - Water: 8 to 9 hrs. estimated (evaporation)(4) Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 2,440 ug/L | Daphnia magna | | EC-50 | (5) |
| 5,590 ug/L | Bluegill Sunfish | | LC-50 | (5) |
| 1,580 ug/L | Rainbow trout | | LC-50 | (5) |
| 6,300 ug/L | Bluegill Sunfish | | 24-hr LC-50 | (6) |
| 5,600 ug/L | Bluegill Sunfish | | 96-hr LC-50 | (6) |

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other: <,10% of odour threshold WHO (11)

Fish Consumption: Aquatic organisms can accumulate DCBs to unacceptable levels for human consumption (of the organisms) at a concentration of 2.6 mg/L in water (EPA). (5)

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Oral LD50 800 mg/kg in guinea pigs (7) Half-Life:
Oral LD50 500 mg/kg in rats (8)

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action: The target systems of DCB are: the liver; the immune components of the blood and bone marrow (reticuloendothelial system); the central nervous system; the respiratory tract and skin. (5)

Max. tolerated dose (MTD) in rats exposed orally 5 days/wk for 28 weeks was 19-190 mg/kg/day (9).
Immediately Dangerous to Life or Health:1,700 ppm (inhalation) OSHA. (9)

Adverse taste in fish: 0.25 mg/L water (1)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources:

Uses: Solvent for waxes, gums, resins, tars, rubbers, oils and asphalts; removing sulphur from illuminating gas; as a degreasing agent for metals, leather and wool; as an ingredient of metal polishes; as a heat transfer medium; as an intermediate in the manufacturing of dyes; also used as an insecticide and fungicide (for pesticide uses see Other Information section). (10)

OTHER INFORMATION

The herbicidal use of 1,2-DCB includes application to underwater vegetation and some land plants. Used as a fumigant for peach tree borer, it is also effective against bark beetles and grubs. 1,2-DCB is also toxic to moths. (7) The chemical is toxic to roots, seeds and seedlings when used as a soil fumigant. It can be used against termites alone or in combination with other active chemicals such as PCP. Controls insects and mites in poultry houses and animal sleeping quarters. Used in the production of low-pressure aerosals because of its insecticidal action and properties as a solvent. (7)

REFERENCES


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2. Ontario Ministry of the Environment. Provincial Water Quality Objectives: Criteria Development Document for Chlorinated Benzenes. Prepared by MacLaren Plansearch Inc., Toronto, Ontario. 1984.
3. Canada, Department of the Environment and Ontario Ministry of the Environment. Environmental Baseline Report of the Niagara River. November, 1981 Update. Canada-Ontario Review Board. November 16, 1981.
4. United States Environmental Protection Agency. Water Related Fate of 129 Priority Pollutants, Vol. II. E.P.A. 4404/4-79-0296. United States Environmental Protection Agency. Office of Toxic Substances, Washington. 20460 D.C.
5. United States Environmental Protection Agency. Ambient Water Quality Criteria for Dichlorobenzenes. Criteria and Standards Division. United States Environmental Protection Agency. Washington, D.C. 20460. 1980.
6. Buccafusco, R.J. et al. Acute Toxicity of Priority Pollutants to Bluegill (Lepomis macrochirus). Bull. Environm. Contam. Toxicol. 26,446-452 (1981).
7. Farm Chemicals Handbook 1980. Meister Publishing Company, Willoughby, Ohio.
8. United States National Academy of Sciences. Drinking Water and Health. Safe Drinking Water Committee, National Academy of Sciences. Washington, D.C. 1977.
9. Report to the Great Lakes Water Quality Board/Great Lakes Science Advisory Board. 1981 Annual Report. Committee on the Assessment of Human Health Effects of Great Lakes Water Quality. November, 1981.
10. Windholz, M.ed. The Merck Index: An Encyclopedia of Chemicals and Drugs. Merck and Company, Inc., Rahway New Jersey, 1976.
11. World Health Organization. Guidelines For Drinking - Water Quality. Volume 1 Recommendations. 1984. ISBN 92 4 154168 7.

IDENTIFICATION

I Name 1,2-Dichloroethane

Chem. Symbol: $C_2 H_4 Cl_2$ CAS No.: 107-06-2 Date: May 2, 1985

Other Common Names: Ethylene dichloride; Ethene dichloride; Ethylene chloride; glycoldichloride; sym-dichloroethane; EDC; Ethylidenechloride; Ethylidene dichloride

II Physical Chemical Properties

MP: -35.4°C BP: 83.5°C Solubility: 8,690 mg/L at 20°C 9,200 mg/L at 0°C VP: 61mmHg at 20°C 40mmHg at 10°C S.G.: 1.25 at 20°C(1)

$BOD_5$: 0.002 standard dilution sewage. (1)

III Appearance and other properties Colourless liquid with a sweet chloroform like odour. (1) EDC is flammable and is dangerous when exposed to heat, flame or oxidizers. Emits phosgene gas when heated to decomposition. (2) Reacts violently with Al, $N_2O_4$ $NH_3$ and dimethylaminopropylamine. (2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: 0.12 ppb/Canagagigue Creek (1979) downstream from Elmira STP. (3) Detected in the St. Clair R. in the low ppb range (1975-1977). (12)

Sediment:

Biological Organisms: Not identified in fish from the St. Clair R.

III Biological Information

Partition Coef.: 1.48 (4) Threshold Odour: 20 mg/L; 29 mg/L (1) Bioaccumulation Factor: Low. Bioconcentration factor in bluegill is 2. (5)

Half-Life - Water: 28 mins.* volatilization (4) Sediment: Fish: 2 days in bluegills (5)

Synergistic, Additive, Antagonistic Factors: Propylene dichloride and orth-dichlorobenzene in combination have a synergistic effect on 1,2-dichloroethane. (13)

| Toxicity Testing: Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 100 mg/L | Water Scud | 21°C | 96-hr. LC50 | (6) |
| 100 mg/L | Stone fly | 15°C | 96-hr. LC50 | (6) |
| 225 mg/L | Rainbow Trout | 13°C | 96-hr. LC50 | (6) |
| 500 mg/L | Fathead minnow | | LC50 | (10) |

Chronic toxicity in fathead minnow embryo larvae occurred at concentrations as low as 2 mg/L. (5)

*Evapor. from a 1 ppm aqueous solution at 25°C, still air and a depth of 6.5 cm.: 28 mins (1)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other: 10 ug/L WHO (see Other Information) (14)

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Oral LD50 670-890 mg/kg in rats (7) Half-Life:

Mutagen: Teratogen: Carcinogen: positive animal (8)

Mode of Toxic Action: EDC causes central nervous system depression and injuries to the liver, kidneys, lung adrenals, bone marrow and cardiac muscle. (2) EDC is toxic to humans by ingestion, inhalation, and absorption through skin and mucus membranes. (5) Ingestion of EDC often results in death which is usually attributed to circulatory and respiratory failure.(5) Patients suffering from acute EDC poisoning have experienced neurological changes, loss of appetite and other gastro-intestinal problems, irritation of mucous membranes, liver and kidney impairment, and in some cases death. (5)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources  Organic chemical industry. (1) Detected in the industrial effluent entering the St. Clair River. (12)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Evaporating leaded gasoline or incompletely burned vehicle exhaust fumes may result in release of significant quantities to the atmosphere, since 1,2-dichloroethane is used in six antiknock fuel additives (for leaded gas). (9)

Uses: Used as an intermediate primarily in the production of vinyl chloride; in the production of trichloroethane, trichloroethylene, vinylidene chloride ethyleneamines; and as an antiknock additive in leaded fuel. Other minor uses are as an insect fumigant for stored grains, mushroom houses, and for soil fumigation around peach and apple orchards; as a cleaner for upholstery and carpets; as a solvent in textile cleaning and metal degreasing, paints, varnishes, and finish removers; as a disperant for plastics and and elastomers such as synthetic rubber; as an ore flotation compound; and as an extractant in certain food processes. (8)

OTHER INFORMATION

Guideline computed from a conservative, hypothetical, mathematical model that cannot be experimentally verified and therefore should be interpreted differently. Uncertainties involved are considerable and variations of two orders of magnitude (i.e., from 0.1 to 10 times the number) could exist.

REFERENCES


1. Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals.Second Edition Van Nostrand Reinhold Company. Toronto. 1983.
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8. United States, Department of Health and Human Services, Public Health Service. Second Annual Report on Carcinogens. Prepared by National Toxicology Program, December, 1981.
9. United States, Carcinogenesis Testing Program, Division of Cancer Cause and Prevention, National Cancer Institute. Bioassay of 1,2-Dichloroethane for Possible Carcinogenicity. National Cancer Institute, Bethesda, Md. 20014. January, 1981. PB-285 968.
10. "Assessing Potential Oceans Pollutants," National Academy of Sciences, Washington, D.C., 1975.
12. Ontario Ministry of the Environment. St. Clair River Organics Study, Identification and Quantification of Organic Compounds. Ontario Ministry of the Environment, 135 St. Clair Avenue West, Toronto, Ontario

IDENTIFICATION

I Name Dichloromethane

Chem. Symbol: $CH_2Cl_2$ CAS No.: 75-09-2 Date: May 2, 1985

Other Common Names: Methylene Chloride; Methylene Bichloride; Methylene Dichloride; DCM

II Physical Chemical Properties

MP: -97°C (1) BP: 40 to 42°C (1) Solubility: 16,700 mg/L at 20°C (1) 20,000 mg/L at 25°C VP: 349 mmHg at 20°C (1) 500 mmHg at 30°C S.G.:

$BOD_5$:

III Appearance and other properties: Colourless liquid. Emits toxic fumes when heated to decomposition (1,2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Others: see Fish Consumption

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: ND - 0.001 ppb raw water in the lower Niagara R. 1979. (3) Identified in the St. Clair River. (4)

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: 1.25 (5) Threshold Odour: 100 mg/L (1) Bioaccumulation Factor: probably low (5)

Half-Life - Water: 19-24 mins.* (evap.) (1) Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 224,000 ug/L | Daphnia Magna | | 48-hr. EC50 | (6) |
| 310,000 ug/L | Fathead minnow | static | 96-hr. LC50 | (6) |
| 193,000 ug/L | Fathead minnow | flow-through | 96-hr. LC50 | (6) |
| 224,000 ug/L | Bluegill | static | 96-hr. LC50 | (6) |

*measured half-life for evaporation from a 1 ppm aqueous solution, still air, and an avg. depth of 6.5 cm: 3.49 mins. at 1-2°C and 18.4-25.2 mins. at 25°C.

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other:

Fish Consumption: Ambient water concentration should not exceed 15.7 ug/L for a lifetime cancer risk of $10^{-6}$. Based on the consumption of 6.5 g/day of fish from contaminated water bodies. (6)

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Oral LD50 2388-4368 mg/kg rats (6)
Oral LD50 1987 mg/kg in mice (6)
Inhalation LD50 14,100 ppm 6 hrs. in mice (6)
Inhalation LD50 11,500 ppm 6 hrs. in guinea pigs (6)

Half-Life: 6 to 6 1/2 hours in adipose tissue. * (6)

Mutagen: potential (6) Teratogen: Carcinogen:

Exposure Effects: The primary results of an acute exposure to DCM are central nervous system depression; cardiotoxic effects; and increased levels of blood carboxyhemoglobin, which are a consequence of the metabolic transformation of DCM to carbon monoxide. Damage to the kidney may result and depending on the dosage it may or may not be reversible. (6) Few dermal effects have been reported, although dermal exposure may result in more severe effects. The two most common routes of exposure to man have been dermally and through inhalation. (6)

* Long half life in adipose tissue, indicates that DCM may very slowly accumulate in body fat with long daily exposures to high air concentrations. (6)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Ontario municipal and industrial loadings of 5.979 kg/day to the Niagara R. and its tributaries Niagara Falls, N.Y. wastewater treatment plant loading of 7.709 kg/day to the Niagara R. (3) Identified in Elmira STP effluent to the Grand R. (7) Formed during chlorination water treatment (8)

Uses: Used as a paint remover, a urethane foam-blowing agent, a vapor degreasing and dip solvent for metal cleaning, a solvent for aerosol products, a solvent in the pharmaceutical industry, a solvent in the manufacture of polycarbonates by polymerization and as an extractant for caffeine, spices and hops. It is used in the manufacture of plastics, textiles, photographic film and photoresistant coatings, as a solvent carrier in the manufacture of herbicides and insecticides and in rapid drying paints and adhesives, carbon removers and brush cleaners. Other minor applications include use as a low pressure refrigerant, as a low-temperature heat transfer medium and as an air-conditioning coolant. The fastest growing use of DCM is as an aerosol. This is due to its substitution for chlorofluorocarbons as a solvent, vapour pressure depressant, and flame retardent. (6)

OTHER INFORMATION

I Case Studies

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5. United States Environmental Protection Agency. Water Related Fate of 129 Priority Pollutants, Vol. . E.P.A. 4404/4-79-0296. United States Environmental Protection Agency. Office of Toxic Substances, Washington. 20460 D.C.
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IDENTIFICATION

I Name 1,2-Dichloropropane

Chem. Symbol: $CH_2ClCHClCH_3$ CAS #: 78-87-5 Date: May 18, 1984

Other Common Names: Propylenedichloride; Propylenechloride

II Physical Chemical Properties

MP: -80 to -100°C BP: 96.8°C Solubility: 2700 mg/L at 20°C VP: 42 mmHg at 20°C 50 mmHg at 25°C S.G.: 1.16 at 20°C (1)

$BOD_5$:

III Appearance and other properties Colourless liquid with a chloroform - like odour. When heated to decomposition, 1,2-dichloropropane emits highly toxic fumes of phosgene (1,2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Others: see * below

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: 1,2-Dichloropropane detected in 1 of 9 raw water samples from the Niagara R. at concentration of 0.001 ppb (1980) (3)

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: 2.28 (calculated)(4) Threshold Odour: Bioaccumulation Factor: partition coefficient indicates some potential for bioaccumulation. (4)

Half-Life - Water: Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results |
|---|---|---|---|
| 52,000 ug/L | Daphnia magna | | 48-hr. LC50 (U.S.EPA) (2) |
| 139,000 ug/L | Fathead Minnows | | 96-hr. LC50 (U.S.EPA) |
| 280,000 ug/L | Bluegill | | 96-hr. LC50 (U.S.EPA) |
| 320,000 ug/L | Bluegill | | 96-hr. LC50 (Dawson et al.) |

* Acute toxicity occurs at concs. as low as 23,000ug/L (7)
* Chronic toxicity occurs at concs. as low as low as 5,700ug/L (7) (8)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other:

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Oral LD50 2200 mg/kg in rats (2)
Oral LD50 2000-4000 mg/kg in guinea pigs (2,5)

Half-Life:

Mutagen: Teratogen: Carcinogen:

Effects of Exposure: Oral:- acute gastrointestinal distress with pulmonary congestion and edema*. Probable oral lethal dose (dichloropropenes) in humans is 50-500 mg/kg or between 1 teaspoon and 1 ounce for a 70 kg. person (150 lbs)*. (6)

*There is a lack of specific information on the effects of 1,2-dichloropropane exposure. Therefore the exposure effects of dichloropropenes have been used because of the similarity to dichloropropane in chemical structure and properties. (6)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Industrial discharges, municipal effluents and run-off from agricultural land. (2)

Uses: Oil and fat solvents; dry cleaning and degreasing processes; soil fumigant used for the control of nematodes; insecticide used on stored grain. (2)

OTHER INFORMATION

I Case Studies

REFERENCES

1. Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals.Second Edition Van Nostrand Reinhold Company. Toronto. 1983.

2. United States Environmental Protection Agency. Water Quality Criteria for Dichloropropane and Dichloropropene. Criteria and Standards Division, Pb81-117541. United States Environmental Protection Agency. Washington, D.C. 20460. October, 1980.

3. Canada, Department of the Environment and Ontario Ministry of the Environment. Environmental Baseline Report of the Niagara River. November, 1981 Update. Canada-Ontario Review Board. November 16, 1981.

4. United States Environmental Protection Agency. Water Related Fate of 129 Priority Pollutants. Vol. II, E.P.A. 4404/4-79-0296. United States Environmental Protection Agency, Office of Toxic Substances, Washington, D.C.

5. Farm Chemicals Handbook 1980. Meister Publishing Company, Willoughby, Ohio.

6. Gosselin, R.E. et. al. Clinical Toxicology of Commercial Products. Fourth Edition, 1976.

7. United States Environmental Protection Agency. Ambient Water Quality Criteria for Dichloropropanes. Criteria and Standards Division. United States Environmental Protection Agency. Washington, D.C. 20460. 1980.

IDENTIFICATION

I Name N-Dimethylnitrosamine

Chem: Symbol: $(CH_3)_2NNO$ CAS #: 62-75-9 Date: August 30, 1982

Other Common Names: N-Methyl-N-nitrosomethanamine; Dimethylnitrosamine; DMNA; DMN;

II Physical Chemical Properties

MP: 151-153°C (1) BP: Solubility: very soluble in water (1) VP: S.G.: 1.005 (1)

$BOD_5$:

III Appearance and other properties Yellow oily liquid. Belongs to a group of compounds known as nitrosamines (or N-nitroso compounds). Nitrosamines are formed through the nitrosation of amide or amine percursor cells. This process may occur in the air, soil, water and in some stored or preserved foods. (1,2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Substance With Unidentified Tolerance Limits (Table 3)* (3) Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: 0.06 (measured), -0.69 (calculated) (4) Threshold Odour:

Bioaccumulation Factor: probably low** (4)

Half-Life - Water: see below *** (4) Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

Toxicity Testing: Concentration Species Test Water Results

Acute toxicity to aquatic life can result with total nitrosamine concentrations as low as 5850 ug/L U.S. EPA (2)

* Moderately toxic to fish - 24 hr. LC50 1000 mg/L (3)

** "The combination of low partition coefficient and complete miscibility with water indicates little potential for bioaccumulation. (4)

*** Photolysis appears to be the major degradative process of DMN in aqueous solution. At expected pollutant levels in the aquatic environment neither volatilization nor sorption processes appear to be important. DMN exhibits resistance to microbial degradation and, in the absence of photolysis, it could have an appreciable lifetime. (4)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other: U.S. EPA 1.4 ng/L for $10^{-6}$ lifetime risk of cancer.* (2)

Fish Consumption:

Tolerance Limits in Other Foodstuffs: DMN has been found in smoked, dried or salted fish, in cheese salami, frankfurters, cured meats and cooked bacon. Many food constituents are either directly capable of conversion to N-nitroso compounds or give rise to nitrosable products. Examples of these food constituents are several amino acids, proteins, vitamins, caffine in coffee, amines in tea and orotic acid in milk. (2)

II Effects

Acute Toxicity: Intraperitoneal LD50 32.2-40.0 mg/kg in rats (1) Half-Life: approx. 4 hrs. in mice and rats (2)

Mutagen: positive animal (2) Teratogen: positive animal (2) Carcinogen: positive human and animal (2)

Mode of Toxic Action:

* based on the consumption of 2 litres/day of water and 6.5 grams/day of fish. (2)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Phenoxy acetic acid derivative pesticides are formulated as amine salts. Some commercial preparations of these pesticides have been found to contain DMN as a contaminant. Some pesticides (atrazine, carbaryl, ferbam, simazine) are nitrosable, therefore, their application on crops represents an environmental source of percursors of N-nitroso compounds. Once the N-nitroso compounds are formed or introduced on agricultural land they may enter the waterways by runoff or by being leached from the soil. (2) Nitrosation of amines occurs in the saliva and gastrointestinal tract of humans. (2)

Uses: Nitrosamines are produced primarily as research chemicals and not for commercial purposes. (2)

OTHER INFORMATION

I Case Studies

REFERENCES

1. Windholz, M.ed. The Merck Index: An Encyclopedia of Chemicals and Drugs. Merck and Company, Inc., Rahway New Jersey, 1976.

2. United States Environmental Protection Agency. Ambient Water Quality Criteria for Nitrosamines. Criteria and Standards Division. United States Environmental Protection Agency. Washington, D.C. 20460. 1980.

3. Ontario Ministry of the Environment. Water Management, Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment. Water Resources Branch, Ontario Ministry of the Environment, 135 St. Clair Ave. W. Toronto, Ontario. 1978.

4. United States Environmental Protection Agency. Water Related Fate of 129 Priority Pollutants, Vol. II. E.P.A. 4404/4-79-0296. United States Environmental Protection Agency. Office of Toxic Substances, Washington. 20460 D.C.

IDENTIFICATION

I Name 2,4-Dimethylphenol

Chem. Symbol: $(CH_3)_2\ C_6H_3OH$ CAS No.: 105-67-9 Date: May 18, 1984

Other Common Names: 2,4-Xylenol; asym-o-xylenol; 2,4-DMP; m-Xylenol

II Physical Chemical Properties

MP: 26°C BP: 211.5°C Solubility: VP: S.G.: 1.036 at 20-24°C (1)

$BOD_5$:

III Appearance and other properties Colourless needles. 2,4-DMP is a monohydric phenol. (1)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 1ug/L (total phenols including 2,4-DMP) to protect against tainting of edible fish flesh. (2) Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: Threshold Odour: 0.4 mg/L (detection) (1) Bioaccumulation Factor: bioconcentration 150 in bluegill (3)

Half-Life - Water: Sediment: Fish: 1 day in bluegill (3)

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 2,120 ug/L | Cladoceran, Daphnia magna | | LC-50 | (3) |
| 16,750 ug/L | Fathead minnow | | LC-50 | (3) |
| 7,750 ug/L | Bluegill | | LC-50 | (3) |
| 500,000 ug/L | Algae (Chlorella pyrenoidose) | | - complete destruction of chlorophyll after 48 hrs. | (3) |
| 292,800 ug/L | Duckweed | | -LC-50 Chlorosis (disease of green plants seen as a yellowing of green parts of the plant) | (3) |

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: 0.002 mg/L (total phenols including 2,4-DMP). (5) Other:

Fish Consumption: approx. concentration causing adverse taste in fish (Rudd) is 1 mg/L of total phenols. (1)

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Oral LD-50 809 mg/kg in mice (3) Half-Life:
Oral LD-50 3200 mg/kg in rats (3)
Dermal LD-50 1040 mg/kg in rats (2,4-DMP Applied to skin of rats in a molten state)(3)

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action: 2,4-DMP is known to be a ATP blocking agent. (3)

The adverse health effects of 2,4-DMP in humans have not been studied but it is believed that the most probable route of exposure to humans is through dermal exposure. (3,4)

Taste threshold: 0.5 mg/L (1)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Water Quality  Lab Specialist: Manager  Phone: 248-3512

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources Coal tar fractionation and coal processing operations.* (1)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Occurs naturally in vegetation and coal. Has been detected in tea,marijuana, tobacco and cigarette smoke.* (1,3) May enter water ways as runoff from ashphalt or roadways. (3)

Uses: Intermediate in the manufacture of phenolic antioxidants, use as a cresylic acid constituent, and use in the manufacture of pharmaceuticals, plastics, resins, disinfectants (microbiocides), solvents, insecticides, fungicides, rubber chemicals, polyphenylene oxide, wetting agents and dyestuffs*. (1)

* 2,4-DMP generally occurs together with six dimethyphenol isomers and three methylphenol (cresol) iso in nature, as well as in several industrial processes, commercial products, and phenolic wastes. (3)

OTHER INFORMATION

I Case Studies

REFERENCES


1. Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals.Second Edition Van Nostrand Reinhold Company. Toronto. 1983.
2. Ontario Ministry of the Environment. Water Management, Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment. Water Resources Branch, Ontario Ministry of the Environment, 135 St. Clair Ave. W. Toronto, Ontario. 1978.
3. United States Environmental Protection Agency. Ambient Water Quality Criteria for 2,4-Dimethylphenol. Criteria and Standards Division. United States Environmental Protection Agency. Washington, D.C. 20460. 1980.
4. United States National Academy of Sciences. Drinking Water and Health. Safe Drinking Water Committee, National Academy of Sciences. Washington, D.C. 1977.
5. Ontario Ministry of the Environment. Ontario Drinking Water Objectives. Revised: September, 1981. Ontario Ministry of the Environment, 135 St. Clair Avenue W. Toronto, Ontario.

IDENTIFICATION

I Name 1,3-Dinitrobenzene

Chem. Symbol: $C_6H_4(NO_2)_2$ CAS No.: 99-65-0 Date: February 20, 1985

Other Common Names: m-Dinitrobenzene; Dinitrobenzol

II Physical Chemical Properties

MP: 89.8°C (1) BP: 300-302°C at 770mmHg (1) Solubility: 469 mg/l at 15°C (1) VP:
S.G.: 1.571 at 0°C (1)
$BOD_5$:

III Appearance and other properties Colourless yellowish needles. (1)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: 1.49 (1) Threshold Odour: Bioaccumulation Factor:
1.69 (2)

Half-Life - Water: Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 53.0 ppm | Daphnia magna | softwater at 20°C | 48hr. EC50 | (2) |
| 7.4 ppm | Fathead minnow | softwater at 20°C | 96hr. LC50 | (2) |
| 0.17 ppm | Algae (Microcytis) | Distilled water pH 7 | Toxicity threshold * | (2) |
| 0.7 ppm | Algae (Scenedesmus) | Distilled water pH 7 | Toxicity threshold * | (2) |

* The chemical concentration causing the onset of cell multiplication inhibition.

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other:

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: *Oral LD (cat): 27 mg/kg (3) Half-Life:
Oral LD50 (wild birds): 42 mg/kg (3)

Mutagen: positive Ames and yeast recombinogenic system tests (2) Teratogen: Carcinogen:

Mode of Toxic Action: Transforms oxyhemoglobin to methemoglobin resulting in cyanosis (see Amiline and Nitrobenzene). (4) Symptoms of exposure range from headache, vertigo, nausea, vomiting diarrhea, fever, exhaustion due to cyanosis, dark chocolate coloured blood, lower lowered blood pressure and circulatory collapse. Subacute and chronic exposures produce secondary anemia, anvrexia, weight loss, insomnia, moiderate cyanosis, and yellow-brown discolouration of the skin. After removal from 1,3-dinitrobenzene and dissipation of symptoms, alcohol and sun exposure can quickly regenerate the symptoms of acute poisoning.(2)

* Lowest published lethal dose according to reference cited.

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources:

Uses: Used in the production of 2,4,6-trinitrotoluene (TNT), the synthesis of dyestuffs and intermediates and in the production of celluloid. (2,5)

OTHER INFORMATION

I Case Studies

REFERENCES

1) Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals.Second Edition Van Nostrand Reinhold Company. Toronto. 1983.

2) R.S. Wentsel, R.G. Hyde, W.E. Jones, et al. Problem Definition Study on 1,3-Dinitrobenzene, 1,3,5-Trinitrobenzene and Di-n-propyl adipate. 1979. Atlantic Research Corporation, 5390 Cherokee Ave. Alexandria Va.

3) Sax, N.I. Dangerous Properties of Industrial Materials. Fifth Edition. 1979. Van Norstrand Reinhold Company.

4) Gosselin, R.E. et al. Clinical Toxicology of Commercial Products. Fourth Edition, Williams and Wilkins Co., Baltimore, Maryland 21202. 1976.

5) M. Sittig. Handbook of Toxic and Hazardous Chemicals. Noyes Publications, Park Ridge, New Jersey, U.S.A. 1981.

IDENTIFICATION

I Name Ethylbenzene

Chem. Symbol: $C_6 H_5 C_2 H_5$ CAS #: 100-41-4 Date: May 22, 1984

Other Common Names:

II Physical Chemical Properties

MP: -95°C (1) BP: 136.2°C (1) Solubility: 152 mg/L at 20°C (1) VP: 7mmHg S.G.: 0.867 at 20°C (1)
140 mg/L at 15°C at 20°C
206 mg/L at 25°C

$BOD_5$:

III Appearance and other properties Clear colourless refractive flammable liquid with characteristic (1) aromatic adour similar to benzene. It belongs to the family of compounds known as arometic hydrocarbons.

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Unidentified Tolerance Limits (Table 3) (2) Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: None identified in St. Clair R. water at either Pt. Edward or Sombra. (3)

Sediment: None identified in any St. Clair R. sediments collected at 9 sites through out the industrialized area. (3)

Biological Organisms: None identified in a variety of fish collected from the St. Clair R. (3)

III Biological Information

Partition Coef.: 3.15 (4) Threshold Odour: 0.140 mg/L (detection) Bioaccumulation Factor: Probably low.(5)

Half-Life - Water: 5-6 hrs. (evap.)* (6) Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results |
|---|---|---|---|
| 48.5 mg/L | Fatheads | soft water | TLm 25-96 hr (1) |
| 42.3 mg/L | Fatheads | hard water | TLm 25-96 hr |
| 35.1-32 mg/L | Bluegills | soft water | TLm 25-96 hr |
| 94.4 mg/L | Goldfish | soft water | TLm 25-96 hr |
| 97.1 mg/L | Guppies | soft water | TLm 29-96 hr |

*Incubation with natural flora in groundwater in the presence of other components of high-octane gasoline (100ul/L): 100% biodegradation after 192 hrs. at 13°C and an initial ethylbenzene conc. of 1.36ul/L. (1)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other: U.S. EPA Water Quality Criterion 1.1mg/L (7)

Fish Consumption: approximate concentration causing adverse taste in fish: 0.25 mg/L (1)

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: 5.46 ml/kg (LD50) in rats (oral) (8) Half-Life:
59 mg/kg (LD50) in rabbits (dermal) (8)
single oral LD50 (rat): in the range of 35,000 mg/kg (1)

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action: Humans - skin irritant and central nervous system depressant. (8)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace contaminants  Lab Specialist: Dr. Otto Meresz  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources Petroleum refining, Organic Chemical Industry. (1) Two Ontario producers are Dow Chemical, Sarnia and Polysar, Sarnia. Total production used for the manufacturing of styrene (8)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Ethylbenze is a constituent of ashphalt and naptha. (1)

Uses: Used in the manufacturing of styrene and acetophenone; also used as a solvent. (1)

OTHER INFORMATION

I Case Studies

REFERENCES


1) Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals.Second Edition Van Nostrand Reinhold Company. Toronto. 1983.

2) Ontario Ministry of the Environment. Water Management, Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment. November, 1978.

3) Ontario Ministry of the Environment. St. Clair River Organics Study. Identification and Quantification of Organic Compounds. Laboratory Services Branch. Ontario Ministry of the Environment, 1981.

4) Tate, M.S. Principles and Practice of Hansch Analysis: A Guide to Structure Activity Correlation for the Medical Chemist. Adv. in Drug Res. 5:1-77 Academic Press, New York, 1971.

5) U.S. Environmental Protection Agency. Water Related Fate of 129 Priort Pollutants Vol. II EPA 4404/4-79-0296. 1979. U.S. EPA, Washington DC 20460

6) MacKay, D. and Leinonen, P.J. Rate of Evaporation of Low Solubility Contaminants from Water Bodies to Atmosphere. Environmental Science and Technology. 9(13): 1178-1180. 1975

7) U.S. Environmental Protection Agency. Water Quality Criteria; Availability. Federal Registar, Wednesday, July 15, 1979. Part III

8) Ontario Ministry of the Environment. Hazardous Contaminants Program. Environmental Aspects of Selected Aromatic Hydrocarbons in Ontario: A Comprehensive Background Report. HCP-1-78. 1978. Air Resources Branch, Ontario Ministry of the Environment.

IDENTIFICATION

I Name 1,2-Ethylene Dibromide

Chem. Symbol: $CH_2$ $BrCH_2Br$ CAS No.: 106-93-4 Date: May 22, 1984

Other Common Names: Ethylenebromide; Ethylenedibromide; Dibromoethane; 1,2-Dibromoethane; glycoldibromide; alpha, beta-Dibromoethane.

II Physical Chemical Properties

MP: 9.97°C (1) BP: 131.6°C (1) Solubility: 4.310 mg/L at 30°C (2) VP: 11 mmHg at 20°C S.G.: 2.7 at 25°C (1)

$BOD_5$:

III Appearance and other properties Colourless liquid (1)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: Threshold Odour: Bioaccumulation Factor:

Half-Life - Water: See*below Sediment: see ** below Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results | | |
|---|---|---|---|---|---|
| 18 ppm | Bluegill | | 48-hr | TLm | (2) |
| 15 ppm | Largemouth bass | | 48-hr | TLm | (2) |

* Persistence is similar to 1,2-dichloroethane suggesting moderate biodegrability. (2) In water EDB hydrolyzes to ethyleneglycol and bromoethanol; under neutral conditions and ambient temperature the half-life of this reaction is 5-10 days. (1)

**EDB is converted almost completely and quatitatively to ethylene in soil cultures and at an initial conc. of $10^{-3}$M (EDB) this degradation process takes approx. 2 months. (1)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other:

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Oral LD50 117 mg/kg in female rats (3) Half-Life:
Oral LD50 148 mg/kg in male rats (3)
Oral LD50 55 mg/kg in female rabbits (3)
Oral LD50 65 mg/kg in man (3)

Mutagen: positive microbial (3) Teratogen: Carcinogen: positive animal (4)

Mode of Toxic Action:

1,2-Ethylenedibromide is toxic via all routes of exposure. (2)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources:

Uses: Used as a solvent for resins, gums, waxes and many organic chemicals; fumigant; agricultural insecticide; and chemical intermediate in the production of certain dyes, drugs and vinyl bromide. The major use (85%) of 1,2-ethylenebromide is as an additive in leaded gasoline, where it scavenges lead oxide residues from the combustion chambers of gasoline engines. (4)

OTHER INFORMATION

I Case Studies

REFERENCES

1. Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals.Second Edition Van Nostrand Reinhold Company. Toronto. 1983.

2. United States, EPA. Oil and Hazardous Materials Technical Assistance Data System. Oil and Special Materials Control Division, Office of Water Program Operations, Washington, D.C. 20460.

3. G.D. Clayton and F. E. Clayton Editors. Patty's Industrial Hygiene and Toxicology. Third Edition. Volume 2B. John Wiley and Sons, New York.

4. United States, Department of Health and Human Services, Public Health Service. Second Annual Report on Carcinogens. Prepared by National Toxicology Program, December, 1981.

IDENTIFICATION

I Name Hexachlorobenzene

Chem. Symbol: $C_6 Cl_6$ CAS #: 118-74-1 Date: May 2, 1985

Other Common Names: Perchlorobenzene, HCB

II Physical Chemical Properties

MP: 227-228°C (1) BP: 322-326°C (1) Solubility: 4-20 ug/l (1) VP: $1.089 \times 10^{-5}$ mmHg (1) S.G.: 2.044 at 20°C

$BOD_5$:

III Appearance and other properties

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 0.0065 ug/L (interim) (2) Others:

Whole Fish (for the protection of fish eating birds): ...uncertain whether ... aquatic birds will biomagnify this compound. (3)

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms: 7-11 ppb (whole fish) Spottail Shiners (young of the year) Niagara-on-the-Lake, ND Spottail Shiners (young of the year) Center Creek, L. Erie (4)

III Biological Information

Partition Coef.: 6.18 (1) Threshold Odour: 3 mg/L (1) Bioaccumulation Factor: 1160-3740 (Bioconcentration) (1)

Half-Life - Water: approx. 8 hrs. (6) Sediment: 4.2 yrs. (5) Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results |
|---|---|---|---|
| 18,500 ug/l | Fathead Minnow | pH 7.5 H.D.45.5 | 32-day B.C.F. (7) |

HCB is quickly absorbed onto sediments and lost from aquatic organisms. Therefore, it appears unlikely that HCB will bioaccumulate through the food chain. The body burden of water organisms is most likely only from water.

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other: 0.01 ug/l WHO (see Other Information) (9)

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: 500 mg/kg in rats (intrapertioneally) (5) Half-Life: 60 days in rats (5)
3 g/kg in guinea pigs. (5)

Mutagen: potential (rats) (5) Teratogen: apparently negative (rats) (5) Carcinogen: positive (mice and hamsters) (5)

Mode of Toxic Action: Neurotoxic symptoms, increased liver weight, porphyria. (1) HCB at doses far below those causing mortality enhances the capability of animals to metabolize organic compounds (i.e. lindane) (5) HCB was found to accumulate in the fetuses of pregnant rats and mice. (5) A study done in 1972 showed that the average concentration of HCB in 57 people sampled in Ontario was 60 ug/kg. (5)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources  By-product from the manufacturing of chlorine, perchloroethylene, carbon tetrachloride, trichloroethylene and other chlorinated hydrocarbons. (5)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources:

Uses: HCB is used as a fungicide to control fungal diseases in cereals. Its main use as a fungicide is is on wheat seed intended solely for planting (the HCB treated seed is unfit for human and animal consumption). In industry HCB is used as a plasticizer for polyvinyl chloride as well as a flame retardent (5). Also used in the manufacture of pentachlorophenol wood perservative, fungicide and in the production of fluorocarbons. (1)

OTHER INFORMATION

Guideline computed from a conservative, hypothetical, mathematical model that cannot be experimentally verified and therefore should be interpreted differently. Uncertainties involved are considerable and variations of two orders of magnitude (i.e., from 0.1 to 10 times the number) could exist.

Since the FAO/WHO conditional ADI of 0.0006 mg/kg body weight has been withdrawn, this value was derived from the linean multi - stage extrapolation model for a cancer risk of less than 1 in 100,000 for a lifetime of exposure.

REFERENCES

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2) Ontario Ministry of the Environment. Provincial Water Quality Objectives: Criteria Development Document for Chlorinated Benzenes. Prepared by MacLaren Plansearch Inc., Toronto, Ontario. 1984.

3) United States Environmental Protection Agency. Water Related Environmental Fate of 129 Priority Pollutants. Vol. II. U.S. EPA, Office of Water Planning and Standards. Washington D.C. 20460. 1979. pg 77-8.

4) Inter Branch (Water Resources) Communication, Karl Suns.

5) United States, Environmental Protection Agency. Ambient Water Quality Criteria for: Chlorinated Benzenes. U.S. Environmental Criteria Office, Office of Water Regulations and Standards, Criteria and Standards Division, U.S. Environmental Protection Agency, Washington DC 20460. October, 1980.

6) MacKay, D. and P.J.L. Leinonen. Rate of Evaporation of Low Solubility Contaminants from Water Bodies to Atmosphere. Environ. Sci. and Technol. 9(13): 1178-1180. 1975.

7) Anon. Jour. Water Poll. Central Fed., V 52(6): 1714. 1980. Ann. Literature Review.

8) Canada, Department of Environment, Ontario Ministry of the Environment. Environmental Baseline Report for the Niagara River. November, 1981. Canada-Ontario Review Board. November 16, 1980. (Table 24).

IDENTIFICATION

I Name Hexachlorobutadiene

Chem. Symbol: $C_4 Cl_6$ CAS #: 87-68-3 Date: May 2, 1985

Other Common Names: Hexachloro-1,3-Butadiene; Perchlorobutadiene; HCBD; 1,3-Hexachlorobutadiene; 1,1,2,3,4,4-Hexachloro, 1-3, Butadiene; CP-40-66: 120, C-46

II Physical Chemical Properties

MP: -19 to -22°C (1) BP: 210 to 220°C (1) Solubility: 2mg/L at 20°C (2) VP: 0.15 mmHg at 20°C (2)

S.G.: 1.675 at 15°C (1) $BOD_5$:

III Appearance and other properties Colourless liquid, faint turpentine - like odour. Soluble in alcohol and ether. (3)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: Identified in effluents entering the St. Clair River. (4)

Sediment: Identified in sediments of the St. Clair River. (4)

Biological Organisms:

III Biological Information

Partition Coef.: 3.74 (calculated)(2) Threshold Odour: 6ppb (1) Bioaccumulation Factor: see below *

Half-Life - Water: 40.7 mins. volatilization Sediment: adsorbed strongly to sediment. (3) Fish:

Synergistic, Additive, Antagonistic Factors: Compounds containing the thiol (SH) group have an antagonistic effect on HCBD. (3)

Toxicity Testing:

| Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 102 ug/L | Fathead Minnows | | LC50 | (3) |
| 320 ug/L | Rainbow Trout | | LC50 | (3) |
| 326 ug/L | Bluegill | | LC50 | (3) |

Chronic toxicity occurs at concs. as low as 9.3ug/L (3)
Acute toxicity occurs at concs. as low as 90ug/L (3)
Non toxic effect level = 3 ug/L (7)

*"Bioaccumulation factors in the order of 1000 have been reported; however significant biomagnification has not been shown. Laseter, et al. (1976) obtained bioconcentration factors for an algal species, - crayfish and largemouth bass of 160,60 and 29 respectively." Over all there is little information concerning the accumulation of HCBD by aquatic organisms from their environment. (2,3)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other:

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: 64 mg/kg (LD50) in female weanling rats (oral) (3) Half-Life:
580 mg/kg (LD50) in adult male rats (oral) (3)

Mutagen: Positive Ames Test, (5) No effect on rat pregnancy or neonatal survival or development. (6) Teratogen: No effect on rat pregnancy or neonatal survival and development. (5) Carcinogen: potential animal (10)

Mode of Toxic Action: Short term lethal exposures result in damage to liver, kidney and depression of of the central nervous system. (3)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources Petrochemical, Chlorohydrocarbon plants. HCBD is a by-product of certain processes associated with chlorination of hydrocarbons (tetrachloroethylene, trichloroethylene carbon terachloride). (3)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Disposal of wastes containing HCBD from chlorinated hydrocarbon industries. (3)

Uses: Solvent for elastomers; heat transfer liquids; transformer and hydraulic fluid, fluid for gyroscopes; snift (chlorine-containing) gas recoverer; chemical intermediate for fluorinated lubricants and rubber compounds. (8)

OTHER INFORMATION

I Case Studies

REFERENCES


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2. United States Environmental Protection Agency. Water Related Fate of 129 Priority Pollutants, Vol. II. E.P.A. 4404/4-79-0296. United States Environmental Protection Agency, Office of Toxic Substances, Washington. 20460 D.C.
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7. Leevwanghll, P. et al. 1975. Toxicity of Hexachlorobutadiene in Aquatic Organisms. Sublethal Eff. Toxicol. Chem. Aqua. Anim. Proc. Swed-Neth. Symp. 167-176. From "CAS":85:41858J.
8. Hawley. Condensed Chemical Distionary Ninth Ed. 436. From "Toxicology Data Bank" files.
9. Laska, Anthony L., Clelmen K. Bartell and John L. Laseter. Distribution of Hexachlorobenzene and Hexachlorobotadiene in Water, Soil and Selected Aquatic Organisms Along the Lower Mississippi River, Louisiana. Bulletin of Environmental Contamination and Toxicology. 15(5): 535-542. 1976.
10. Michigan State, Critical Materials Register, 1980. Publication Number 4833-5323 Environmental Services Division, Michigan Department of Natural Resources. P.O. Box 30028, Lansing, Michigan. 48909.

IDENTIFICATION

I Name Methylmercaptan

Chem. Symbol: $CH_3SH$ CAS No.: 74-93-1 Date: May 22, 1984

Other Common Names: Methanethiol; Methylthioalcohol; Mercaptomethane, Thiomethyl Alcohol; Methyl Sulfhydrate

II Physical Chemical Properties

MP: -123.1°C (1) BP: 6 to 7.6°C (1) Solubility: VP: 400 mmHg at 7.9°C (1) S.G.: 0.868 at 20-24°C (1)

$BOD_5$:

III Appearance and other properties Colourless gas. Has characteristic odour of decayed cabbage. (1) Very flammable flash point is 18°C and it produces highly toxic fumes including sulfur dioxide. (2) Below the boiling point it is a water-white liquid. (2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Substance with Undefined Tolerance Limit (Table 3) (4) Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: Threshold Odour: 0.041 to 0.0011 mg/L (1) Bioaccumulation Factor:

Half-Life - Water: Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 1 ppm | Fathead minnows | | 48 hr. TLm | (2) |
| 1 ppm | White bass | | 105 mins. Lethal Dose | (2) |
| .55-.9 ppm | Salmonides | | TLm | (1) |

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other:

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Inhl. LC 10,000 ppm rats (4) Half-Life:

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action: Ingestion causes irritation of mouth and stomach, tremors, paralysis and unconsciousness. Contact with liquid irritates eyes and skin. Inhalation causes irritation of the respiratory system tremors, paralysis, unconsciousness, death may follow respiratory paralysis. (2)

Taste Threshold: Taste has been detected at 0.0011 mg/L. (1)

ETHYLMERCAPTAN (cont.)

I Analytical Source

NVIRON-ENTAL ETECTION

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

I Industrial and Commerical Sources

OURCES AND USES

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Found in coal tar; petroleum distillates; and in urine after ingestion of asparagus. Methylmercaptan is produced in the intestinal tract by the action of anaerobic bacteria on albumin. (3)

Uses: Methymercaptan is used in the manufacturing of pesticides; pharmaceuticals; dimethyl sulfide; fungicides; methionine; in jet fuels; and in preparation of plastics. Also used as a food flavour additive in coffee, onion, and garlic flavours. (3)

OTHER NFORMATION

I Case Studies

REFERENCES


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2. United States, Environmental Protection Agency. Oil and Hazardous Materials. Technical Assistance Data System. Oil and Special Materials Control Division, Office of Water Program Operations. Washington, D.C. 20460.
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4. Windholz, M.ed. The Merck Index: An Encyclopedia of Chemicals and Drugs. Merck and Company, Inc., Rahway New Jersey, 1976.

IDENTIFICATION

I Name Mirex (Dechlorane)

Chem. Symbol: $C_{10}$ $Cl_{12}$ CAS #: 2385-85-5 Date: May 2, 1985

Other Common Names: Dodecachlorooctahydro - 1,3,4,-metheno-2H-cyclobuta (cd) pentalene; Mirex, GC-1283 (Allied), Dechlorane 5-10, Dechlorane 70-40. Dechlorane is the name commonly used for Hooker Chemicals fire retardant line, Dechlorane AO and Dechlorane Plus are not $C_{10}$ $C_{12}$.

II Physical Chemical Properties

MP: 485° BP: Solubility: 0.001 mg/l
0.24 mg/L at 24°C
(Practical grade)(11)
VP: $8 \times 10^{-4}$ pascals (1) S.G.:

$BOD_5$:

III Appearance and other properties: White, odourless, solid. Decomposes at about 650°C to give hexachlorobenzene as the major product. It is very stable and unreactive. (1)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 0.001 ug/l unfiltered (2) Others: 0.005 of 96-hr. LC50 (Canada, 1972) (3)

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: ND because of extremely low solubility. (4)

Sediment: ND-40 ppb L. Ontario, 7.5 ppb ave. in contaminated soils L. Ontario (5)

Biological Organisms: 0-250 ppb in L. Ontario fish; usually ND elsewhere. Up to ppm levels in Herring Gulls eggs. (6, 9)

III Biological Information

Partition Coef.: Threshold Odour: Bioaccumulation Factor: 2,580 (fish); 12,200 (algae); 14,650 (daphnids)* (11)

Half-Life - Water: Sediment: 12 years (7) Fish: 130 days (1)

Synergistic, Additive, Antagonistic Factors:

Toxicity Testing: Concentration Species Test Water Results

*Bioaccumulation factors in the range of 28,900-50,000 have been recorded for sheepshead minnows exposed to 0.038 ug/L mirex for 70 days. (11)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other: *HWC no standard needed at present time. (1)

Fish Consumption: 0.1 ppm Health and Welfare Canada. (8)

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: 306 mg/kg (LD50) in male rats oral (7)
800 mg/kg (LD50) in rabbits dermal (7)
Half-Life: Less than 100 days in rats (1)

Mutagen: Teratogen: potential (10) Carcinogen: positive (animal)(10)

Mode of Toxic Action: Enzyme inducer in rats, especially of the hepatic microsomal mixed function oxidases. It also has been shown to be tumorigenic in mice. (1)

* Mirex (Dechlorane) has not been detected in Canadian drinking water. "Because mirex (Dechlorane) is a synthetic organic chemical it is desirable that it be absent from drinking water supplies. It is recommended therefore, that drinking water obtained from sources which might be contaminated with mirex be monitored to ensure that mirex is not detectable." (1)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticides Lab. Lab Specialist: Manager Phone: 248-3846

Others:

II Detection Limits

Water: Biological: Air:

Sediment: Other:

SOURCES AND USES

I Industrial and Commerical Sources The producer of Mirex was Hooker Chemical Co. Niagara N.Y. 1959-1967. From 1968-1975 Hooker Chemical Co. packaged the material which it purchased from the Allied Chemical Co. (7) Mirex (as Dechlorane) was imported into Ontario for use by Innmont Presstile Limited, Georgetown and the Kayson Plastics Co., Preston. (9)

Amt. Produced: Consumed: Discharge: Air: Water: Land:

Other Sources: Found in the door panel seams of Chrysler and GM cars and trucks manufactured between 1963 and 1970. (4)

Uses: Was used as both bait in ant traps and as a pesticide for the control of fire ants in the south south eastern United States. Used in Ontario as a fire retardent in plastics. No other uses since 1970. (7, 9)

OTHER INFORMATION

I Case Studies 1976 Ministry of the Environment Investigation by the West Central Region (Preston) and Central Region (Georgetown) in consultation with WRB staff.

REFERENCES


1. Canada, Department of Health and Welfare. Guidelines for Canadian Drinking Water Quality, 1978. Supporting Documentation. Supply and Services Canada 1980. (Cert. No. H48-10/1978-1E)
2. Ontario Ministry of the Environment. Water Management, Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment. November, 1978.
3. Canada Department of Environment. Guidelines for Surface Water Quality. Vol. 1 Inorganic Chemical Substances: Preamble. Inland Waters Directorate, Water Quality Branch, Ottawa, Canada, 1979.
4. Inter-Office Communication, A.F. Johnson, WRB.
5. Canada, Department of Environment. Mirex in the Sediments of Lake Ontario. R. Frank, et al Canada Centre for Inland Waters Department of the Environment, Burlington, Ontario.
6. Ontario Ministry of the Environment, Water Resources Branch. Ontario Sportfish Data.
7. Water, E.M., Gerstner, H.B. and Huff, J.E. Mirex: A Risk Benefit Evaluation. Toxicology Information Response Center, Information Centre Complex, Information Division, Oak Ridge National Labratory, Oak Ridge, Tennessee 37830.
8. Health and Welfare Canada. Interim Guideline.
9. Ontario Ministry of the Environment, Water Resources Branch, Working Files: Mirex.
10. State of Michigan, Critical Materials Register 1980. Publication Number 4833-5323 Environmental Services Division, Michigan Department of Natural Resources. P.O. Box 30028, Lansing, Michigan, 48909.
11. Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals.Second Edition Van Nostrand Reinhold Company. Toronto. 1983.

IDENTIFICATION

I Name Monochlorobenzene

Chem. Symbol: $C_6H_5Cl$ CAS No.: 108-90-7 Date: May 2, 1985

Other Common Names: Chlorobenzene; Phenylchloride; Benzene Chloride

II Physical Chemical Properties

MP: -45°C BP: 132°C Solubility: 500 mg/L at 20°C VP: 8.8 mmHg at 20°C, 11.8 mmHg at 25 °C S.G.: 1.1066 at 20°C (1)

$BOD_5$: 0.03 Std. dil. sew. (1)

III Appearance and other properties Colourless, very refractive liquid with a faint not unpleasant odour. (2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 15 ug/L (interim) (9) Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: 2.84 (3) Threshold Odour: 10-20 ug/l (4), 30 ug/l (10) Bioaccumulation Factor:

Half-Life - Water: 9 hrs.* and 10-11 hrs.** Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results |
|---|---|---|---|
| 29 ppm | Fathead minnow | | 96 hr. TLm (5) |
| 24 ppm | Bluegill | 25°C | 24-96 hr. TLm (6) |
| 20 ppm | Bluegill | softwater | 96 hr. TLm (5) |

* This half-life is an estimate based on experimental results and conditions in unaerated distilled water. (3)

** This half-life is based on the calculated Henry constant of monochlorobenzene. It reflects the time of evaporation of monochlorobenzene from a one meter column of water. (3)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other: <10% of the threshold odour concentration WHO (10)

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Oral LD50 3g/kg in rats (7) Half-Life:

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action: CNS depressant. Degeneration of the liver and kidney has been observed in animals following absorption of toxic doses. (4)

Taste Threshold: 20 ug/L (4)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Textile plant effluents. (7) Waste water treatment plant loadings of 2.494 kg/day Niagara Falls N.Y. Ontario municipal and industrial loadings 0.007 kg/day to the Niagara River and its tributaries. (8)

Uses: Manufacturing of aniline, phenol, chloronitrobenzene; solvent for paints; intermediate in dyestuffs.(1,2)

OTHER INFORMATION

I Case Studies

REFERENCES


1. Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals.Second Edition Van Nostrand Reinhold Company. Toronto. 1983.
2. Windholz, M.ed. The Merck Index: An Encyclopedia of Chemicals and Drugs. Merck and Company, Inc., Rahway New Jersey, 1976.
3. United States Environmental Protection Agency. Water Related Fate of 129 Priority Pollutants, Vol. II. E.P.A. 4404/4-79-0296. United States Environmental Protection Agency. Office of Toxic Substances, Washington. 20460 D.C.
4. Patty's Industrial Hygiene and Toxicology. Third Revised Edition. Volume 2B. George D. Clayton, Florence E. Clayton Editors. John Wiley and Sons, New York.
5. Pickering et al. "Acute Toxicity of Some Important Petrochemicals to Fish," Journ. Water Poll. Contr. Fed., 1966, 38(9):1419-1429.
6. Middlebrooks, E.J., et al. "Effects of Temperature on the Toxicity to the Aquatic Biota of Waste Discharges. A Compilation of the Literature," NTIS Pb. - 239127, October, 1973.
7. United States Environmental Protection Agency. Ambient Water Quality Criteria for Chlorinated Benzenes. Criteria and Standards Division. United States Environmental Protection Agency. Washington, D.C. 20460. 1980.
8. Canada, Department of the Environment and Ontario Ministry of the Environment. Environmental Baseline Report of the Niagara River. November, 1981 Update. Canada-Ontario Review Board. November 16, 1981.
9. Ontario Ministry of the Environment. Provincial Water Quality Objectives: Criteria Development Document for Chlorinated Benzenes. Prepared by MacLaren Plansearch Inc., Toronto, Ontario. 1984.
10. World Health Organization. Guidelines For Drinking - Water Quality. Volume 1 Recommendations. 1984. ISBN 92 4 154168 7.

IDENTIFICATION

I Name Nitrobenzene

Chem. Symbol: $C_6 H_5 NO_2$ CAS No.: 98-95-3 Date: February 11, 1985

Other Common Names: Nitrobenzol; Oil of mirbane; Essence of mirbane

II Physical Chemical Properties

MP: 6°C (1) BP: 211°C (1) Solubility: 1,900 mg/l at 20°C (1) VP: 0.15 mm at 20°C (1) S.G.: 1.20 at 25° C (1)
$BOD_5$: Nil standard dilution sewage at < 400 mg/l (1)

III Appearance and other properties Colourless to pale yellow, oily liquid with the odour of almond. (2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: 1.85/1.88(1) Threshold Odour: 0.03mg/l (3) Bioaccumulation Factor: Low based on nitrobenzene's solubility and partition coefficient.

Half-Life - Water: see* below Sediment: see* below Fish: see* below

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 117 mg/l | Fathead minnow | L.Superior water | 96 Hr. LC50 | (5) |
| 43 mg/l | Bluegill sunfish | | 96 Hr. LC50 | (6) |
| 27 mg/l | Daphnia magna | | 48 Hr. LC50 | (7) |

*There is no way, with the available data, to ascertain which environmental process is the most predominant in removing nitrobenzene from the aquatic environment. However, both photochemical and biological degradation can lead to a build up of a large variety of organic nitrogen compounds, two of which, namely diphenylhydrazine and benzidine are presently on the U.S. EPA's list of a 129 priority pollutants. (4)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other:

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Oral LD (dog): 750 mg/kg* (8) Half-Life:
Dermal LD (rabbit): 600 mg/kg* (8)
Dermal LD (mouse): 400 mg/kg* (8)

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action: Causes cyanosis (deficient oxygenation of the blood) due to the formation of methemoglobin (transformation product of oxyhemoglobin because of the oxidation of $Fe^{2+}$ to $Fe^{3+}$). (8)

Nitrobenzene is toxic via all routes. Mean oral lethal dose lies approximately in the range of 1 to 5 gm. (9)

* Lowest published lethal dose according to reference cited.

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Trace Organics  Lab Specialist: Manager  Phone: 248-3846

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources Organic Chemical Industry. (1)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources:

Uses: Manufacturing of aniline, dyestuffs, pyroxylin compounds, rubber chemicals, drugs, cellulose acetate and photographic chemicals. Nitrobenzene is a constituent in soaps and metal and shoe polishes. It is a solvent for cellulose ethers and a solvent in the production of TNT. (1,2)

OTHER INFORMATION

I Case Studies

REFERENCES


1. Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals.Second Edition Van Nostrand Reinhold Company. Toronto. 1983.
2. Windholz, M.ed. The Merck Index: An Encyclopedia of Chemicals and Drugs. Merck and Company, Inc., Rahway New Jersey, 1976.
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5. Holcombe, G.W. et al. The Acute Toxicity of Selected Substituted Phenols, Benzenes and Benzoic Acid Esters to Fathead Minnows (Pimephales promelas). Environmental Pollution (Series A) 35(1984) 367-381. Elsevier Applied Science Publishers Ltd. England.
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8. Sax, N.I. Dangerous Properties of Industrial Materials. Fifth Edition. 1979. Van Norstrand Reinhold Company.
9. Gosselin, R.E. et al. Clinical Toxicology of Commercial Products. Fourth Edition, Williams and Wilkins Co., Baltimore, Maryland 21202. 1976.

IDENTIFICATION

I Name Pentachlorophenol

Chem. Symbol: $C_6 Cl_5 OH$ CAS #: 87-86-5 Date: May 2, 1985

Other Common Names: PCP, Penta, Santophen 20.

II Physical Chemical Properties

MP: 188-191°C BP: 309-310°C (decomposes) Solubility: 14 mg/l at 20°C (1) 5 mg/l at 0°C V.P.: 0.00011mmHg at 20°C (5) S.G.: 1.978 (5)

$BOD_5$:

III Appearance and other properties White or brown beads or flakes (Technical grade PCP). PCP acts as weak acid and readily dissociates to form corresponding salt in a alkaline solution. (1)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 0.5 ug/L (interim) (2) Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: 5 ng/l-1400 ng/l Canadian Great Lakes shoreline(nearshore); 65-1,300 ng/l sewage effluent from 7 STPs in S. Ontario. (4)

Sediment: 300 ng/g (dry weight) Bay of Quinte-highest input observed in L. Ontario; 16.9 ug/g (dry weight) Thunder Bay L. Superior. (4)

Biological Organisms: 200 ng/g (whole fish, wet wt.) Bay of Quinte, L. Ontario; 0.1 - 1.0ppm lake trout and sicowet, 0.02-0.60 ppm lake whitefish Thunder Bay, Michipicoten Bay and Marathon area L. Superior. (4)

III Biological Information

Partition Coef.: 5.01(1) Threshold Odour: 0.857 to 12.0 mg/L(5) Bioaccumulation Factor: 13 (Bluegill muscle)(1) 475 goldfish at 0.2ppm exp.(5)

Half-Life - Water: Sediment: see * below Fish: 24 hrs. (1)

Synergistic, Additive, Antagonistic Factors:

Toxicity Testing:

| Concentration | Species | Test Water | Results |
|---|---|---|---|
| 20.0 ppm | Green Sunfish | Static bioassay | Repelled, distress (4) |
| 5.0 ppm | Green Sunfish | Static bioassay | Not repelled, but distressed (4) |
| 0.05 ppm | Bluegill | Soft Water, 24°C | 24hr LC50 |
| 0.05 ppm | Bluegill | Hard Water, 24°C | 24hr LC50 |
| 8.0 ppm | Fathead Minnows | 18-22°C freshwater-Static bioassay | 1 hr LC50 |
| 0.6 ppm | Fathead Minnows | 18-22°C freshwater-Static bioassay | 24, 48, 72, 96hr LC50 |

Fish species appear to be more sensitive to PCP than invertebrate species, and salmonid species more sensitive than non-salmonid species. (1)
*Biodegradation in soil suspention: Less than 72 days for complete disappearance. (5)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other: 10 ug/l WHO (6)

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Oral $LD_{50}$ (rats): 27-210 mg/Kg (5) Oral $LD_{50}$ (rabbit): 70-100 mg/Kg (5) Half-Life: 1.25 days in humans. (1)

Mutagen: Teratogen: negative (rats) (1) Carcinogen: negative (rats) (1)

Mode of Toxic Action: PCP acts as an uncoupler of mitochondrial phosphorylation in Vitro and also interferes with microsomal detoxication function in Vitro. (4)
Non-fatal chronic exposure symptoms include muscle weakness, headache, anorexic abdominal pain and weight loss in addition to skin, eye and respitory tract irritation. (1)

Taste Threshold: 0.03 mg/L (5)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources  Uniroyal Chemical Division located at Clover Bar Alberta, currently is the only producer of chlorophenols in Canada. (4)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources:

Uses: PCP is primarily used as a perservative in the lumber and leather tanning industry. (4)

OTHER INFORMATION

I Case Studies

REFERENCES

1) U.S. Environmental Criteria and Assessment Office. Ambient Water Quality Criteria for: Pentachloropheol. Office of Water Regulations and Standards, Criteria and Standards Division, U.S. Environmental Protection Agency, Washington D.C. 20460. October 1980.

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3) Canada, Department of the Environment, Ontario Ministry of the Environment. Environmental Baseline Report of the Niagara River. November, 1981. Canada-Ontario Review Board. November 16, 1981. (Table 24)

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5) Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals.Second Edition. Van Nostrand Reinhold Company. Toronto. 1983.

6) World Health Organization. Guidelines For Drinking - Water Quality. Volume 1 Recommendations. 1984. ISBN 92 4 154168 7.

IDENTIFICATION

I Name Polychlorinated Biphenyls

Chem. Symbol: See Other Information Section CAS #: Each PCB compound or mixture of PCBs is assigned individual CAS No. see Other Information Section Date: August 30, 1982

Other Common Names: PCBs, Aroclor 1016, Aroclor, 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254 Aroclor 1260. (Aroclor is Monsanto's trade name for the technical mixtures of PCBs)

II Physical Chemical Properties

MP: 278-415°C (1) BP: Solubility: 0.025-0.2 mg/l at 20°C (1) VP: 0.008-0.67 pascals (1)

$BOD_5$:

III Appearance and other properties Commercial PCB mixtures vary in appearance from a clear oil (low chlorination) a light viscous liquid, to a light yellow sticky resin (high chlorination). PCBs vary widely in their physical properties according to the degree and position of chlorination. All PCBs have low solubility, low vapour pressure and high dielectric constants. Properties which make these compounds so widely used in industrial applications are their thermal stability, strong resistance to both acidic or basic hydrolysis and their general inertness. (2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: *0.001 ug/l unfiltered (3) Others: 0.001 ug/l U.S. EPA (4)

Whole Fish (for the protection of fish eating birds):

Sediments: 0.05 ppm dry weight (Dredging Guidelines) (5)

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms: PCBs are most consistently found in fish from W. Lake Ontario with concentrations in high lipid (fat) species such as lake trout and salmon often exceeding the 2ppm fish consumption guideline and occasionally ranging as high as 10ppm (Port Credit). (7)

III Biological Information

Partition Coef.: 2.8-7.14 (8) Threshold Odour: Bioaccumulation Factor: High.$10^4$-$10^6$ fish, invertebrates and phytoplankton.** (9)

Half-Life - Water: Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

Toxicity Testing:

| Concentration | Species | Test Water | Results |
|---|---|---|---|
| 0.54mg/l (Aroclor 1242) | Bluegill | Intermittent | 15 day exposure 15 day mortality LC50 (9) |
| .076mg/l (Aroclor 1248) | Bluegill | Flow bioassay | 15 day exposure 15 day mortality LC50 (9) |
| .204mg/l (Aroclor 1254) | Bluegill | 20°C | 15 day exposure 15 day mortality LC50 (9) |
| .245mg/l (Aroclor 1260) | Bluegill | | 20 day exposure 20 day mortality LC50 (9) |

*This substance has a zero tolerance limit ("Water Management" Surface Water Management Policy 4) and releases should be completely eliminated. (3)

**"The potential for bioaccumulation of PCBs is directly related to the number of chlorines for two reasons first, the more highly chlorinated PCB species have a greater partition coefficient, and secondly, the heavier PCB species are more resistant to biodegradation." (8)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: 3 ug/l (1) Other: No Federal Canadian guideline* (1)

Fish Consumption: 2 ppm Health and Welfare Canada (HWC) (11)

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: 8650 mg/kg (Arochlor 1242) in rats (oral) (9) Half-Life:
11000 mg/kg (Arochlor 1248) in rats (oral) (9)
1000 mg/kg (Arochlor 1260) in rats (oral) (9)

Mutagen: Teratogen: Potential (9) Carcinogen: positive (rat) (9)

Mode of Toxic Action: Chloracne and melanosis have been noted in industrial workers exposed (dermally) to PCBs and persons poisoned by ingestion of rice oil containing high levels of PCBs. In some cases effects included loss of appetite, nausea, edema of face and hands, vomiting and burning and soreness of the eyes. (9) The main storage area of PCBs in the body is fat tissue. (11)

*Regulations are being developed under the Environmental Contaminants Act to prevent further dispersions of PCBs in the Canadian Environment. The establishment of a maximum acceptable concentration for PCBs in drinking water is therefore, not considered necessary at this time. (11)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticides  Lab Specialist: Manager  Phone: 248-3846

Others:

II Detection Limits

Water: 0.001 to 0.02 ug/l (12)  Biological: 0.001 to 0.02 ug/l (12)  Air:

Sediment: 0.001 to 0.02 ug/l (12)  Other: 0.001 to 0.02 ug/l (Ind. Wastes, sewage and sludge) (12)

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources:

Uses: Uses of PCBs are now restricted to closed-system electrical and heat transfer applications. In the past PCBs were used as plastizers, hydraulic fluids, lubricants and miscellaneous applications such as surface coatings, adhesives, printing inks and pesticide extenders. (1)

OTHER INFORMATION

Chem. Symbol: emperical formula $C_{12}$ $H_{10-n}$ $Cl_n$ where n equals any number from 1 to 10.(11)

CAS.#: Aroclor 1242, 534-692-19; Aroclor 1248, 126-722-96, Aroclor 1254, 110-976-91; Aroclor 1260, 110-968-25. "Aroclors are technical mixtures of a number of PCBs made by the chlorination of biphenyl in the presence of a suitable catalyst. In the designation of the individual Aroclors (Monsanto TM) a set of four digits was used, the first two, 12, indicate the preparation is a mixture. The second set of digits are used to denote the approximate percentage (by weight) of chlorine.
(ie. Arochlor 1260 contains 60% chlorine). (2)

REFERENCES


1) Canada, Department of Health and Welfare. Guidelines for Canadian Drinking Water Quality, 1978. Supporting Documentation. Supply and Services Canada 1980. (Cert. No. H48-10/1978-1E)

2) United States, Environmental Protection Agency. Water Related Environmental Fate of 129 Priority Pollutants. Volume I: Introduction and Technical Background, Metals and Inorganics and Pesticides and PCBs. By Michael A. Callahan et al. Office of Water Planning and Standards, Office of Water and Waste Management, U.S. Environmental Protection Agency, Washington, D.C. 20460. December 1979.

3) Ontario Ministry of the Environment. Water Management, Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment. November, 1978.

4) Canada, Department of the Environment. Water Quality Sourcebook. A Guide to Water Quality Parameters. Inland Waters Directorate, Water Quality Branch, Ottawa, Canada, 1979.

5) Ontario Ministry of the Environment. Evaluating Construction Activity Impacting on Water Resources. Prepared by D. Persaud and W.D. Wilkins, Ministry of the Environment, Water Resources Branch. January, 1976.

6) Ontario Ministry of the Environment, Water Resources Branch, Enhanced Tributary Monitoring Data.

7) Ontario Ministry of the Environment, Water Resources Branch. Guide to Eating Ontario Sportfish data.

8) United States, Environmental Protection Agency. Water - Related Environmental Fate of a 129 Priority Pollutant. Vol. I. Office of Water Planning and Standards, Office of Water and Waste Management, U.S. Environmental Protection Agency, Washington DC20460. December 1979.

9) Canada, National Research Council. Polychlorinated Biphenyls: Biological Criteria for an Assessment of Their Effects on Environmental Quality. NRC Associate Committee on Scientific Criteria for Environmental Quality, Subcommittee on Pesticides and Related Compounds. Pb. No. NRC 16077. 1978.

10) Ontario Ministry of the Environment. Ontario Drinking Water Objectives. Revised, September 1981.

11) Ontario Ministry of the Environment. Guide to Eating Ontario Sport Fish. Ontario MOE Water Resources Branch. 1981.

12) Ontario Ministry of the Environment. Outlines of Analytical Methods. Coordinated by Water Quality Section. Labratory Services Branch, June 1981.

IDENTIFICATION

I Name Quinoline

Chem. Symbol: $C_6H_4NCHCHCH$ CAS No.: 91-22-5 Date: March 1, 1985

Other Common Names: Benzo (b) pyridine; 1-Benzazine; Chinoline; Chinoleine; leucoline; leucol; leukol

II Physical Chemical Properties

MP: -19.5°C (1) BP: 237.7°C (1) Solubility: 60,000 mg/L (1) VP: 1 mmHg at 59.7°C S.G.

$BOD_5$: 1.71 standard dilution sewage (1)

III Appearance and other properties Colourless liquid. Emits toxic fumes when heated to decomposition and reacts violently with perchromates. (2) Quinoline is an extremely hygroscopic liquid, absorbing up to 22% water. (3)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: 2.03/2.06 (1) Threshold Odour: 0.016-4.3 ppm (1) Bioaccumulation Factor:

Half-Life - Water: see * below Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 57.2 mg/L | Chironomus tentans | (midge) | 48 hr. LC50 | (4) |
| 5.0 mg/L | Rainbow trout | 13°C | Lethal after a 14 hr. exposure | (3) |
| 5.0 mg/L | Bluegill Sunfish | 13°C | Lethal after a 4 hr. exposure | (3) |
| 1-7.5 mg/L | Yearling trout | 13°C | Lethal after a 1 hr. exposure | (3) |

* Biodegrades fairly rapidly. (5)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other:

Fish Consumption: see * below for fish tainting

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Single dose oral LD50 (rat): 0.46g/kg (1) Half-Life:
Dermal LD50 (rat): 540 mg/kg

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action:

* Fish-flesh tainting: 0.1 to 0.5 mg/L (1)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources  Dye manufacturing; Coal-Conversion Processes.

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Occurs in small amounts in coal tar. (6)

Uses: Used in the manufacturing of dyes and in the preparation of hydroxyquinoline (Quinosol) and niacin. Quinoline is also used as a preservative for anatomical specimens. (6)

OTHER INFORMATION

I Case Studies

REFERENCES


1. Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals.Second Edition Van Nostrand Reinhold Company. Toronto. 1983.

2. N. Irving Sax. Dangerous Properties of Industrial Materials. Fith Edition. Van Nostrand Reinhold. 1979.

3. State of California. Water Quality Criteria. Edited by J.E. McKee and H.W. Wolf. 1963. The Resources Agency of California, State Water Quality Control Board.

4. Cushman, R.M. and McKamey, M.I. A chironomus tentans Bioassay for Testing Synthetic Fuel Products and Effluents, with Data on Acridine and Quinoline. Bull. Environm. Contam. Toxicol. 26, 601-605 (1981).

5. U.S. Environmental Protection Agency. Oil and Hazardous Materials. Technical Assistance Data System. Oil and Special Materials Control Division, Office of Water Program Operations. Washington, D.C. 20460.

6. Windholz, M.ed. The Merck Index: An Encyclopedia of Chemicals and Drugs. Merck and Company, Inc., Rahway New Jersey, 1976.

IDENTIFICATION

I Name Styrene

Chem. Symbol: $C_6 H_5 CH=CH_2$ CAS No.: 100-42-5 Date: May 24, 1984

Other Common Names: Vinylbenzene; Ethenylbenzene; Cinnamene; Dinnamol; Phenylethylene, Styrol; Styrolene

II Physical Chemical Properties

MP: -30.6°C BP: 145.2°C Solubility: 280 mg/L at 15°C 300 mg/L at 20°C VP: 5mmHg at 20°C 9.5mmHg at 30°C S.G.: 0.9045 at 25°C (1)

$BOD_5$:

III Appearance and other properties Colourless liquid. (1)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Substance with undefined Tolerance Limits (Table 3) (2) Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: ND - 1.0 ppb Niagara River at Fort Erie (1980), ND elsewhere in the Niagara R. (1980). (3)

Sediment:

Biological Organisms: Identified in St. Clair R. fish species (walleye, splake, bluegill, pumpkin seed emerald shiner and black crappie) in 1977. (4)

III Biological Information

Partition Coef.: Threshold Odour: 0.74 mg/L (avg.) (1) Bioaccumulation Factor:

Half-Life - Water: Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

Toxicity Testing:

| Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 56.73 mg/L | Fathead Minnow | Soft | 24hr TLm | (5) |
| 53.58 mg/L | Fathead Minnow | Soft | 48hr TLm | (5) |
| 46.41 mg/L | Fathead Minnow | Soft | 96hr TLm | (5) |
| 62.81 mg/L | Fathead Minnow | Hard | 24hr TLm | (5) |
| 62.81 mg/L | Fathead Minnow | Hard | 48hr TLm | (5) |
| 59.30 mg/L | Fathead Minnow | Hard | 96hr TLm | (5) |

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other:

Fish Consumption: approx. concentration causing adverse taste in fish: 0.25 mg/L. (1)

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Oral LD50: 316 mg/kg in mice (6)
Oral LD50: 4920 mg/kg in rat (7)
Half-Life:

Mutagen: positive animal (8) Teratogen: Carcinogen: potential animal (9)

Mode of Toxic Action: Skin and eye irritant. General central nervous system depressant. (8)
Dermal Exposure: Direct contact with liquid styrene produces drying and cracking of skin. (10)

Inhalation Exposure: Irritates mucosal membranes at vapour concentration above 200 ppm, but pungent odour usually gives adequate warning. (10)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources Polysar and the Dow Chemical Company of Sarnia, Ontario (8)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources:

Uses: In Ontario styrene is used almost exclusively for the manufacture of polymers, including polystyrene, acrylonitrile butadiene-styrene (ABS) terpolymer, styrene-acrylonitrile copolymer, and for the production of styrene-butadiene synthetic rubber. A very small amount of the styrene produced is used in solvent applications for styrene polymers. (8)

OTHER INFORMATION

I Case Studies

REFERENCES


1. Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals. Van Nostrand Reinhold Company. Toronto. 1977.
2. Ontario Ministry of the Environment. Water Management, Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment. Water Resources Branch, Ontario Ministry of the Environment, 135 St. Clair Ave. W. Toronto, Ontario. 1978.
3. Canada, Department of the Environment and Ontario Ministry of the Environment. Environmental Baseline Report of the Niagara River. November, 1981 Update. Canada-Ontario Review Board. November 16, 1981.
4. Ontario Ministry of the Environment. St. Clair River Organics Study, Identification and Quantification of Organic Compounds. Ontario Ministry of the Environment, 135 St. Clair Avenue West, Toronto, Ontario
5. Pickering, Q.H. and C. Henderson. Acute Toxicity of Some Important Petrochemicals to Fish. Journal WPCF, Vol. 38, No. 9. P.P. 1419-29. September, 1966.
6. Report to the Great Lakes Quality Board/Great Lakes Science Advisory Board. 1981 Annual Report. Committee on the Assessment of Human Health Effects of Great Lakes Water Quality. November, 1981.
7. Union Carbide Data Sheet, New York. Found via U.S. EPA, Oil and Hazardous Materials. Technical Assistance Data System (OHM-TADS).
8. Ontario Ministry of the Environment. Hazardous Contaminants Programme. Environmental Aspects of Selected Chlorinated Hydrocarbons in Ontario. A Comprehensive Background Report. HCP-2-78. Air Resources Branch, Ontario Ministry of the Environment. 135 St. Clair Ave., W. Toronto, Ontario. 1978.
9. Michigan State, Critical Materials Register, 1980. Publication Number 4833-5323 Environmental Services Division, Michigan Department of Natural Resources. P.O. Box 30028, Lansing, Michigan. 48909.
10. Gosselin, R.E. et al. Clinical Toxicology of Commercial Products. Fourth Edition, Williams and Wilkins Co., Baltimore, Maryland 21202. 1976.

IDENTIFICATION

I Name 2,3,7,8-Tetrachlorodibenzo-p-Dioxin

Chem. Symbol: $C_{12}$ $H_4$ $Cl_4$ $O_2$ CAS #: 1746-01-6 Date: May 2, 1985

Other Common Names: 2,3,7,8-TCDD, dioxin, TCDD

II Physical Chemical Properties

MP: 305-307°C BP: Solubility: 0.2 ug/L (2) VP: S.G.:

$BOD_5$:

III Appearance and other properties Colourless solid (1), 2,3,7,8-TCDD decomposes at 800°C and in the presence of ultra violet light (sun light). (3)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Unspecified Others: Absent from all compartments of the ecosystem (IJC). (4)

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: not detected in surface water at 0.2 ppt. (5)

Sediment: not studied (5)

Biological Organisms: Most consistently detected in western Lake Ontario salmonids with values usually less than 20 ppt. (5)

III Biological Information

Partition Coef.: Threshold Odour: Bioaccumulation Factor: High. 8000 in channel catfish. (6)

Half-Life - Water: Sediment: 550-590 days (lake sediments)* (7) Fish: Not determined

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results |
|---|---|---|---|
| 0.000056 ug/l | Coho Salmon | | 96 hrs. 12% mortality (6) |
| 0.0023 mg/kg(in food) | Rainbow Trout | | 672 hrs. feeding decline (6) |
| 2,300 mg/kg (in food) | Rainbow Trout | | 30 days mortality, feed decline weight loss, fin erosion fungal growth, liver degeneration (6) |

According to present day knowledge 2,3,7,8-TCDD isomer is the most toxic of the chlorinated dioxins. (3)
*Half-life in model aquatic environment is in the order of 600 days. (13)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other:

Fish Consumption: 20 ppt Health and Welfare Canada (8)

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: 0.6-2.1 ug/kg-bw (LD50) in guinea pigs (male)
100 ug/kg-bw (LD50) in rats. (1)
3 mg/kg-bw (LD50) in hamsters. (9)

Half-Life: 15-25 days biological 1/2 life in lab animals. (10)

Mutagen: Teratogen: positive (rats) (1) Carcinogen: positive (rats and mice) (1)

Using three generations of rats a tentative "no effect" concentration in food has been set at 0.001 ng/kg/day. (4)

Mode of Toxic Action: The most common human effect is chlorache. Other effects are oedema, kidney and liver damage, cardiovascular disorder, anorexia, fatigue, neuromuscular disorder and psychological changes. (1,10) Some experimental data has suggested that immunosuppresive effects occur at concentrations too low to produce clinical or pathological signs of toxicity. (1) Even if a single dose has no effect cummulative effects of continuous exposure could in theory be significant. It should be noted that not all symptoms have been clearly linked to TCDD exposure. (1)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Dioxin Facility (Pesticide Section) Lab Specialist: H. Tosine Phone: 248-3846

Others:

II Detection Limits

Water: 0.2 ppt total TCDD (11) Biological: 1-2 ppt (fish) (11) Air:

Sediment: Other:

SOURCES AND USES

I Industrial and Commerical Sources 2,3,7,8-TCDD is formed under certain conditions of alkalinity and high temperatures during the manufacturing of 2,4,5-Trichlorophenol. (10)

Amt. Produced: Consumed: Discharge: Air: Water: Land:

Other Sources: Impurity in the herbicide 2,4,5-T. (1) Municipal incinerators, diesel truck and car emissions and home fire place soot. (12) The burning of chlorophenols or materials like wood shavings, plywood or waste oil containing chlorophenols. Waste sites containing still bottoms from the manufacturing of 2,4,5-trichlorophenol. (5)

Uses: No uses

OTHER INFORMATION

I Case Studies Refer to MOE Dioxin and Dibenzofuran Work Group - Chairman A.F. Johnson

REFERENCES


1) Canada National Research Council. Phenoxy Herbicides - Their Effects on Environmental Quality With Accompanying Scientific Criteria for 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD). NRC Associate Committee on Scientific Criteria for Environmental Quality. Subcommittee on Pesticides and Related Compounds. Pb. No. NRCC16075. 1978.

2) Crummett, W.B. and R.H. Stehl. Determination of Chlorinated Dibenzo-p-Dioxins and Dibenzofurans in Various Materials. Environmental Health Perspectives. 5:15-25. 1973

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4) International Joint Commission, Great Lakes Science Advisory Board. Report of the Aquatic Ecosystem Objectives Committee. I.J.C. Great Lakes Regional Office. 100 Ouellette Avenue, Windsor, Ontario N9A 6T3.

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6) United States EPA. 2,3,7,8-Tetrachlorodibenzo-p-Dioxin. Ambient Water Quality Criteria. Criteria and Standards Division, Office of Water Planning and Standards, U.S. Environmental Protection Agency, Washington, D.C.

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9) Canada National Research Council, Associate Committee on Scientific Criteria for Environmental Quality. Polychlorinated Dibenzo-p-Dioxins: Criteria for their effects on man and his environment. Subcommittee on Pesticides and Organic Chemicals in association with subcommittee on Water. 1981. Pb. No. NRCC 18574.

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11) Ontario Ministry of the Environment. Status Report on Dioxins. Prepared March 5, 1981. Unpublished.

12) R.R. Bumb, et al. Trace Chemistries of Fire: A Source of Chlorinated Dioxins. Science October 24, 1980. Volume 210, Number 4468.

13) Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals.Second Edition Van Nostrand Reinhold Company. Toronto. 1983.

IDENTIFICATION

I Name Tetrachloroethylene

Chem. Symbol: $CCl_2 = CCl_2$ CAS #: 127-18-4 Date: May 22, 1984

Other Common Names: 1,1,2,2-tetrachloroethylene, perchloroethylene, ethylene tetrachloride, Nima, perclene, P.C.E., Ankilostin

II Physical Chemical Properties

MP: -22.7°C (2) BP: 121.4°C Solubility: 150 mg/l at 25°C (2) VP: 14 mmHg at 20°C (2) S.G.: 1.626 at 20°C (2)

$BOD_5$: 0.06 mg/L (2)

III Appearance and other properties Clear, colourless, non-flammable, mobile liquid, pleasant ethereal odour. (1)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Undefined Tolerance Limits (Table 3)(3) Others: 310 ug/l 24 hr. avg. not to exceed 700 ug/l U.S. EPA (4)

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: 2 ug/l identified in St. Clair R. at Sombra. (5)

Sediment: 400 mg/kg identified in St. Clair R. sediment adjacent to Dow Chemical, Sarnia (5)

Biological Organisms: Not identified in 6 species of St. Clair R. fish. (5)

III Biological Information

Partition Coef.: 2.60 (2) Threshold Odour: Bioaccumulation Factor: Measured: 49 (6)

Half-Life - Water: Measured: 27 ± 3 minute (7) Sediment: Fish: less than 1 day (4)

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 18.4 mg/l | Fathead Minnow | - | 96-hr. LC50 Flow-thru test | (8) |
| 21.4 mg/l | Fathead Minnow | - | 96-hr. LC50 Static test | (8) |
| 12.9 mg/l | Bluegill Sunfish | - | 96-hr. LC50 Static test | (6) |
| 17.7 mg/l | Water flea | - | 48-hr. LC50 Static test | (6) |
| 14.4 mg/l | Ridear Sunfish | - | 21-day EC50 Loss of equilibrium | (6) |

Acute and chronic toxicity to freshwater aquatic life may occur at concs. as low as 5.280mg/L and .840mg/L respectively, and may be lower for sensitive species. (4)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other: 0.80ug/l for $10^{-6}$ life time risk U.S.EPA*(4)

Fish Consumption: For a lifetime cancer risk of $10^{-6}$ from eating contaminated fish (water excluded) the ambient water conc. should not exceed 8.85ug/L (U.S.EPA). (4)

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: 8120 mg/kg in rabbits (4)
5 ml/kg in cats (4)

Half-Life: 2 weeks in fatty tissue (9)

Mutagen: Teratogen: Carcinogen: positive animal (10)

Mode of Toxic Action: Depression of the central nervous system with varying degrees of "drunkenness" including stupor, unconscious and failure of respiratory centers. (4)

*Based on the consumption of 2 litres/day of water and 6.5 grams/day of fish. (4)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources Manufactured by Dow Chemical Canada Ltd., Sarnia (9)

Amt. Produced: 17 Gg year* (9)  Consumed:  Discharge: Air:  Water:  Land:

Other Sources:

Uses: Fluorocarbon manufacture, drycleaning solvent, metal cleaning and degreasing. (9)

* Gg = 1000 metric tonnes

OTHER INFORMATION

I Case Studies

REFERENCES


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9) Ontario Ministry of the Environment. Hazardous Contaminants Programme. Environmental Aspects of Selected Chlorinated Hydrocarbons in Ontario. A Comprehensive Background Report. HCP-2-78. 1978.

10) State of Michigan, Critical Materials Register 1980. Publication Number 4833-5323 Environmental Services Division, Michigan Department of Natural Resources. P.O. Box 30028, Lansing, Michigan, 48909.

IDENTIFICATION

I Name Toluene

Chem. Symbol: $C_6 H_5 CH_3$ CAS No.: 108-88-3 Date: May 2, 1985

Other Common Names: methylbenzene, phenylmethane, toluol, methylbenzol, methacide (1)

II Physical Chemical Properties

MP: -95°C BP: 110.8°C Solubility: 515 mg/L at 20°C (2); 470 mg/L at 16°C VP: 30mmHg at 26°C; 10mmHg at 6.4°C; 22mmHg at 20°C S.G.: 0.867 at 20°C (16)

$BOD_5$: 1.23 mg/L std. dil. sew. acclimated. (16)

III Appearance and other properties Clear, colorless, refractive, non-corrosive liquid. Distinctive aromatic odor, milder than benzene. (3)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Undefined tolerance limit (Table 3) (4) Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms: Identified in five species of St. Clair River fish at concentrations up to 130 ug/kg. (5)

III Biological Information

Partition Coef.: 2.69 (6) Threshold Odour: 1 mg/l (7) Bioaccumulation Factor: Probably low. (8)

Half-Life - Water: 5.18 hrs. (9) *Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results | | |
|---|---|---|---|---|---|
| 56-34 mg/L | Fathead Minnow | - | 24-96 hr. | LC-50 | (10) |
| 24.0 mg/L | Bluegill Sunfish | - | 24-96 hr. | LC-50 | (10) |
| 57.0 mg/L | Gold Fish | - | 24-96 hr. | LC-50 | (10) |
| 63-59 mg/L | Guppy | - | 24-96 hr. | LC-50 | (10) |
| 313 mg/L | Daphnia magna | | 48 hr. | EC-50 | (12) |
| 245 mg/L | Algae: Chlorella vulgaris | | 48 hr. | EC-50 | (12) |

Acute toxicity occurs at concs. as low as 1.75 mg/L. (12)

*Incubation with natural flora in groundwater in the presence of other components of high octane gasoline (100 ul/L): 100% biodegraded after 192 hrs. at 13°C and an initial toluene conc. of 2.22 ul/L. (16)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other:

Fish Consumption: Approx. conc. causing fish tainting: more than 0.25 mg/L. (13)

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Oral $LD_{50}$ (rat): 5,300 mg/kg (12) Half-life:

Mutagen: negative (12) Teratogen: Carcinogen: negative* (12)

Mode of Toxic Action: Depression of the central nervous system. (5)
Inhalation Exposure: Fatigue, headache, weakness, and throat and eye irration occured in subjects exposed to 200ppm toluene . At higher concentrations (300-700ppm) of toluene, perceptual speed and co-ordination are affected. Toluene appears to have limited toxicity potential, other than its capacity to inhibit CNS function and predispose subjects to cardiac arrhythmias (irregular heartbeat). Exposures to quantities of toluene sufficient to produce unconsciousness fail to produce residual organ damage in human victims.

* There have been no accounts in literature in which cancer in human populations has been attributed to toluene. However, some researchers have suggested that chronic exposure to hydrocarbon solvents may predispose certain individuals to certain types of cancer. (12)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3048

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources Oil refining and coke production by-product. (15)

Amt. Produced: 364 Gg/yr.* (15) Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Found in gasoline. Many toluene uses are open ended, thus, considerable amounts are lost to the atmosphere . (15) Commonly found in industrial effluents entering the St. Clair R. (5)

Uses: Manufacture of benzene derivatives medicines, dyes, T.N.T., solvent for paints, coating gums, resins, rubber. (15)

*Gg = metric tonnes

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I Case Studies

REFERENCES


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14) United States National Academy of Sciences. Drinking Water and Health. Safe Drinking Water Committee, National Academy of Sciences. Washington, D.C. 1977.

15) Ontario Ministry of the Environment. Hazardous Contaminants Programme. Environmental Aspects of Selected Chlorinated Hydrocarbons in Ontario. A Comprehensive Background Report. HCP-2-78. Air Resources Branch, Ontario Ministry of the Environment. 135 St. Clair Ave., W. Toronto, Ontario. 1978.

IDENTIFICATION

I Name: 1,1,2-Trichloroethane

Chem. Symbol: $CH_2ClCHCl_2$ CAS No.: 79-00-5 Date: May 2, 1985

Other Common Names: Vinyl trichloride

II Physical Chemical Properties

MP: -35 to -36.7°C BP: 113.7°C Solubility: 4,500 mg/L at 20°C VP: 19 mm Hg at 20°C S.G.: 1.44 at 20°C (1)

$BOD_5$: BOD bottle experiments unable to demonstrate any significant oxygen absorption. (2)

III Appearance and other properties: Colourless, nonflammable liquid, with a pleasant odour. (1,3)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Others: U.S. EPA 310 ug/L for a 24 hr. avg., never to exceed 710 ug/L. (4)

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: 2.17 (calculated) (2) Threshold Odour: 50 mg/L(1) Bioaccumulation Factor: probably low

Half-Life - Water: 21 min.* (evaporation) (2) Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 18,000 ug/L | Daphnia magna | | 48 hr. EC50 | (4) |
| 81,700 ug/L | Fathead minnow | | 96 hr. LC50 Flow-through test, measure concentrations | (4) |
| 40,200 ug/L | Bluegill sunfish | | 96 hr. LC50 | (4) |
| 9,400 ug/L | Fathead minnow | | Embryo-larval test (chronic exposure) | (4) |

*Half-life may be in the order of several minutes to a few hours depending on the degree of agitation.

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other:

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Oral LD50 0.1 to 0.2 g/kg in rats (5) Half-Life: Eliminated mainly through the lungs. (6)

Mutagen: Teratogen: Carcinogen: Qualitative and quantitative responses may be similar to carbon tetrachloride. (7)

Mode of Toxic Action: CNS depression and liver damage. (5)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources Organic chemical industry. (1)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: General use of chlorinated rubber in labratories. (1) Identified in several effluents entering the St. Clair Rvier isomer not stated. (8)

Uses: Solvent for fats, waxes, natural resins, alkaloids, oils and chlorinated rubber. Also used in the manufacturing of 1,1-dichloroethylene. (1,3)

OTHER INFORMATION

I Case Studies

REFERENCES


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7. Browning,E. Toxicity and Metabolism of Industrial Solvents. Elsevier Publishing Company. Amsterdam. 1965.

8. Ontario Ministry of the Environment. St. Clair River Organics Study, Identification and Quantification of Organic Compounds. Ontario Ministry of the Environment, 135 St. Clair Avenue West, Toronto, Ontario

IDENTIFICATION

I Name Trichloroethylene

Chem. Symbol: $CCl_2 = CHCl$ CAS #: 79-01-6 Date: May 22, 1984

Other Common Names: Ethinyl trichloride, trielene, Tri-clene, trichloran, Trichloren, algylen, trimar, triline, tri, T.C.E.

II Physical Chemical Properties

MP: -73 °C BP: 86.7°C Solubility: 1000 mg/L VP: 77 mmHg S.G.: 1.46 (1)

$BOD_5$:

III Appearance and other properties Clear, colourless, mobile, non-flammable liquid, chloroform-like odour. (1)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Unidentified Tolerance Limits (Table 3) (2) Others: U.S.EPA; 1,500 ug/L 24Hr. ave. and never to exceed 3,400 ug/L. (6)

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: 1 ug/l has been identified in the St. Clair R. at Sombra (3)

Sediment: 100 ppm has been identified in the St. Clair R. sediment adjacent to Dow Chemical, Canada (3)

Biological Organisms: Trichloroethylene has not been identified in five species of St. Clair R. fish (3)

III Biological Information

Partition Coef.: 2.29 (1) Threshold Odour: 10 mg/l (4) Bioaccumulation Factor:

Half-Life - Water: 21 ± 3 min.(measured) (5) Sediment: Fish: less than 24 hr. (6)

Synergistic, Additive, Antagonistic Factors:

Toxicity Testing:

| Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 600 mg/l | Daphnia (crustacean) | - | LD100: 40 hours | (4) |
| 100 mg/l | Daphnia (crustacean) | - | No effect | (4) |
| 63 mg/l | Microcystis aeruginosa | - | Inhibition of cell | (4) |
| 24.4 mg/l | (bluegreen alga) | | division | (4) |
| 24 mg/l | Bluegill sunfish | - | 96hr LC50 | (6) |
| 85.2 mg/l | Water flea | - | 48hr LC50 | (6) |

Residue problems in fish are unlikely at concentrations that are not directly lethal (6)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other: U.S.EPA 2.7ug/L for a lifetime cancer risk of $10^{-6}$.* (9)

Fish Consumption: Aquatic organisms can accumulate trichloroethylene to unacceptable levels for human consumption (of the organisms) at a concentration of 80.7ug/L in water U.S.EPA (9)

Tolerance Limits in Other Foodstuffs: 10 mg/kg in instant coffee; 25 mg/kg ground coffee and 30 mg/kg spice extracts (United States) (6)

II Effects

Acute Toxicity: 3-5 ml/kg (LD50) in rats (6) Half-Life:
8000 ppm (LC50) in rats (inhalation) (6)

Mutagen: Teratogen: Carcinogen: Suspected (7)

Mode of Toxic Action: Liver toxicant, central nervous system depressant. (1)

* Based on the assumption that individuals would be drinking water and eating fish, etc. from a given water body. (9)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources Not manufactured in Ontario. (8)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources:

Uses: Vapour degreasing solvent. Drycleaning solvent. Extractant of naturally occurring substances such as caffine from coffee beans. (8)

OTHER INFORMATION

I Case Studies

REFERENCES


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9) United States Environmental Protection Agency. Ambient Water Quality Criteria for Trichloroethylene. Criteria and Standards Division. United States Environmental Protection Agency. Washington, D.C. 20460. 1980.

IDENTIFICATION

I Name 2,4,5-Trichlorophenol

Chem. Symbol: $C_6 H_3 Cl_3 O$ CAS No.: 95-95-4 Date: May 18, 1984

Other Common Names: Dowicide 2; 2,4,5-TCP; Phenol, 2,4,5-Trichloro; Dowicide B (sodium salt of 2,4,5-TCP; see Other Information Section).

II Physical Chemical Properties

MP: 67°C (1) BP: 253°C (1) Solubility: Slightly soluble, (1) 2g/100g of water. VP: S.G.: $BOD_5$:

III Appearance and other properties 2,4,5-TCP occurs as gray flakes in a sublimed mass with a strong phenolic odour. Weak monobasic acid. (1,11) 2,3,7,8-TCDD is an impurity formed during the production of 2,4,5-TCP. This particularly toxic dioxin has been associated with synthetic compounds derived from 2,4,5-TCP. (11)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 18 ug/L (Trichlorophenols, interim) (2) Others: U.S.EPA 1.0ug/L for taste and odour in ambient water (4)

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms: 10 - 22 ppb in young-of-the-year spottail shiners, lower Niagara R. at Niagara-on-the-Lake (1979). (3)

III Biological Information

Partition Coef.: 3.72 (4) Threshold Odour: 200 ug/L at 20-22°C (4) Bioaccumulation Factor:

Half-Life - Water: Sediment: see * below Fish:

Synergistic, Additive, Antagonistic Factors: The toxicity of 2,4,5-TCP predictably decreases with rising pH. (9)

| Toxicity Testing: Concentration | | Species | Test Water | Results | |
|---|---|---|---|---|---|
| 1,000 | ug/L | Rainbow Trout | - | 48-hrs. lowest concentration which killed 50% or more of the test fish. | (8) |
| 1,700 | ug/L | Goldfish | - | 24-hr. LC50 | (8) |
| 6,100 | ug/L | Bluegill | - | 24-hr. LC50 | (8) |
| 4,500 | ug/L (avg) | Bluegill | - | 96-hr. LC50 | (8) |
| 5 | umol/L | | pH6 | 96-hr. LC50 | (9) |
| 6.3 | umol/L | | pH7 | 96-hr. LC50 | (9) |
| 15.5 | umol/L | | pH8 | 96-hr. LC50 | (9) |

* Decomposition in suspended sediments: Less than 72 days for complete dissappearance (10)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other: U.S.EPA 2.6mg/L for the protection of human health. (4)

Fish Consumption:

Tolerance Limits in Other Foodstuffs: Acceptable daily intake is 7 mg for a 70Kg person (150 lb.) (4)

II Effects

Acute Toxicity: Oral LD50 2.8g/kg in rats (5)
Probable oral lethal dose (human) 0.5-5g/Kg or between 1 oz. and 1 pint for a 70Kg person (150 lb) (5)

Half-Life: approx. 20 hrs. in sheep's blood (4)

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action: Interferes with energy production within cells, specifically the inhibition of oxidative phosphorylation (may be due to dissociated chlorophenol ion) (6)

Effects of Exposure: Trichlorophenols can produce redness and edema on skin contact. On prolonged contact mild and moderate chemical burns have been noted on the skin of man. In the eye trichlorophenols can induce conjunctival irritation and sometimes corneal injury and iritis. (12)

Taste Threshold in Water: 1.0 ug/L (4)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticides  Lab Specialist: Manager  Phone: 248-3846

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: May be formed during the chlorination of waste water and drinking water when phenols are present. Degradation product of 2,4,5-T, silvex, ronnel, lindane, and benzene hexachloride. (4, 11)

Uses: Fungicide, bacteriacide. Starting material in the manufacturing of a series of industrial, agricultural and textile chemicals; in the production of the pesticides silvex, ronnel, and sodium 2,4,5-trichlorophenate. Used as an antiseptic and disinfectant on swimming pool deck surfaces, in households sickroom equipment, food processing plants and equipment, food contact surfaces, hospital rooms, and bathrooms. (7)

OTHER INFORMATION

2,4,5-TCP and its sodium (Na-2,4,5-TCP) and potassium (K-2,4,5-TCP) salts are used as fungicides, algacides and bacteriacides. The formulas for the 2,4,5-TCP salts are: Na-2,4,5-TCP; $C_6H_2Cl_3ONa$; K-2,4,5 TCP; $C_6H_2Cl_3OK$. (11) 2,4,5-TCP and its salts are frequently mixed with other pesticides including pentachlorophenol, tetrachlorophenol, and sodium pentachlorophenate. (11)

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8) Buccafusco, R.J. Ells, S.J., and G.A. Blanc. Acute Toxicity of Priority Pollutants to Bluegill (Lepomis macrochirus). Bull. Environ. Contam. Toxicol. 26, 446-452 (1981).

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12) Gleason, M.N. et al., Ed. 1976. Registry of Toxic Effects of Chemical Substances. Volumes I and II. NIOSH. Cincinnati, Ohio.

IDENTIFICATION

I Name 2,4,6-Trichlorophenol

Chem. Symbol: $C_6H_3Cl_3O$ CAS No.: 88-06-2 Date: July 27, 1984

Other Common Names: Dowcide 2S; Omal; 2,4,6-TCP; sym-trichlorophenol

II Physical Chemical Properties

MP: 68 °C (1) BP: 244.5°C (1) Solubility: 800 mg/L at 25°C (1) VP: S.G.: 1.490 (1)

$BOD_5$:

III Appearance and other properties Yellow needle-like crystals, strong phenolic odour. (2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 18 ug/L (Trichlorophenols, interim (3) Others: U.S. EPA, 2.0 ug/L for organoleptic effects (2)

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: Sediment:

Biological Organisms: 12-33 ppb in young-of-the-year spottail shiners, Niagara-on-the-Lake, Niagara R. (1979) and ND-8 ppb in young-of-the-year spottail shiners, Centre Creek, L. Erie (1979). (4)

III Biological Information

Partition Coef.: 3.38 (5) Threshold Odour: 0.10 to 1.0 mg/L (1) Bioaccumulation Factor:

Half-Life - Water: Sediment: see * below Fish:

Synergistic, Additive, Antagonistic Factors: The toxicity of 2,4,6-TCP predictably decreases with rising pH. (6)

Toxicity Testing:

| Concentration | Species | Test Water | Results |
|---|---|---|---|
| 0.72 mg/L | Bluegill | - | 24-hr LC50 (7) |
| 0.32 mg/L (avg) | Bluegill | - | 96-hr LC50 (7) |
| 3.1 umol/L | Guppy | pH 5 | 96-hr LC50 (6) |
| 4.5 umol/L | Guppy | pH 6 | 96-hr LC50 (6) |
| 11.6 umol/L | Guppy | pH 7 | 96-hr LC50 (6) |
| 39.8 umol/L | Guppy | pH 8 | 96-hr LC50 (6) |

*Decomposition in soil suspension: 5 days for complete disappearance (1)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other: U.S. EPA 1.2 ug/L for a $10^{-6}$ lifetime risk of cancer.* (2)

Fish Consumption: For the consumption of aquatic organisms only the concentration should not exceed 3.6ug/L (for a lifetime cancer risk of $10^{-6}$). (2)

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Intraperitoneal LD50 276-303 mg/kg in rats (olive oil solvent). (2) Probable oral lethal dose (human) 0.5-5 g/kg or between 1 oz. and 1 pint (or 1 lb.) for a 70 Kg person (150 lbs.) (8)

Mutagen: Teratogen: Carcinogen: animal positive (9)

Mode of Toxic Action: Interferes with energy production with in cells, specifically the inhibition of oxidative phosphorylation (may be due to dissociated chlorophenol ion). (6)

Effects of Exposure: Trichlorophenols can produce redness and edema on skin contact. On prolonged contact, mild and moderate chemical burns have been noted on the skin of man. In the eye, trichlorophenols can induce conjunctival irritation and sometimes corneal injury and iritis. (8)

Taste Threshold: 1.0 mg/L (1) Taste detected at 0.002 mg/L (1).

*Based on the consumption of 2 litres of water/day and 6.5 grams of fish/day.

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticide  Lab Specialist: Manager  Phone: 248-3846

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources Organic Chemical Industry; pesticide manufacturing. (1)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Flue gas condensate from municipal incinerators. Chlorination of waters containing phenols. (2) 0.0001 kg/day direct municipal loading and ND direct industrial loading to the Niagara R., January 26 - February 24, 1981. (4)

Uses: Used in the manufacturing of antiseptics, bacteriacides, fungicides, germicides, wood and glue preservatives; also used as an anti-mildew agent for textiles. (1)

OTHER INFORMATION

I Case Studies

REFERENCES


1) Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals.Second Edition Van Nostrand Reinhold Company. Toronto. 1983.

2) United States Environmental Protection Agency. Ambient Water Quality Criteria for Chlorinated Phenols. Criteria and Standards Division. United States Environmental Protection Agency. Washington, D.C. 20460. 1980.

3) Ontario Ministry of the Environment. Provincial Water Quality Objectives: Criteria Development Document for Chlorinated Phenols. Prepared by IEC Beak Consultants Ltd., Mississauga, Ontario. March 1984.

4) Canada, Department of the Environment and Ontario Ministry of the Environment. Environmental Baseline Report of the Niagara River. November, 1981 Update. Canada-Ontario Review Board. November 16, 1981.

5) United States Environmental Protection Agency. Water Related Fate of 129 Priority Pollutants, Vol. II. E.P.A. 4404/4-79-0296. United States Environmental Protection Agency. Office of Toxic Substances, Washington. 20460 D.C.

6) Saarikoski, J. and Viluksela, M. Influence of pH on the Toxicity of Substuted Phenols of Fish. Arch. Environm. Contam. Toxicol. 10,747-753 (1981).

7) Buccafusco, R. J. et at. Acute Toxicity of Priority Pollutants to Bluegill (Lepomis macrochirus). Bull. Environm. Contam. Toxicol. 26,446-452 (1981).

8) Gosselin, R.E. et al. Clinical Toxicology of Commercial Products. Fourth Edition, Williams and Wilkins Co., Baltimore, Maryland 21202. 1976.

9) Michigan State, Critical Materials Register, 1980. Publication Number 4833-5323 Environmental Services Division, Michigan Department of Natural Resources. P.O. Box 30028, Lansing, Michigan. 48909.

10) Patty. Industrial Hygiene and Toxicology. 2nd Edition. Volume II.

IDENTIFICATION

I Name meta-Xylene

Chem. Symbol: $C_6 H_4 (CH_3)_2$ CAS No.: 108-38-3 Date: May 2, 1985

Other Common Names: m-Xylol; 1,3-Dimethylbenzene; m-Dimethylbenzene; 1,3-Xylene (1) m-Xylene

II Physical Chemical Properties

MP: -48 to -53°C BP: 139°C Solubility: Insol. in water (11) VP: 6mmHg at 20°C S.G.: 0.864 at 20°C (2)

$BOD_5$: Biodegrades slowly with acclimated seed (1)

III Appearance and other properties Clear, colorless, refractive, flammable liquid. Characteristic benzene-like odor. (1,2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Undefined tolerance limit (3) Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: Xylenes found in St. Clair River water. (4)
Sediment: Not found in St. Clair R. sediment (4)

Biological Organisms: Xylenes identified in St. Clair R. walleye splake, emerald shiner, black crappie bluegill and pumpkin seed. Maximum concentration; 330 ug/Kg. (4)

III Biological Information

Partition Coef.: 3.20 Threshold Odour: 1.0 ppm (2) Bioaccumulation Factor:

Half-Life - Water: see * below Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: | Concentration | Species | Test Water | Results | |
|---|---|---|---|---|---|
| | 16 mg/L | Goldfish | - | 24-hr LC-50 | (2) |

*Incubation with natural flora in groundwater in the presence of other components of high-octane gasoline (100 ul/L): 100% biodegradation after 192 hrs. at 13°C and an initial conc. of m-Xylene of 3.28 ul/L. (2)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other:

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Rats oral LD-50: 4.3g/Kg (7) Half-Life:
Mice Inhl LC-84: 11,500ppm

Mutagen: Teratogen: Defects in chick embryo. Isomer not stated (7) Carcinogen:

Mode of Toxic Action: Rabbits exposed to 11,500ppm of meta-Xylene for 40 to 55 days showed a reversible decrease in red and white cell count and an increase in thrombocytes. Also reversible liver and kidney damage. (10)

ENVIRON-MENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 298-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources Xylenes identified in industrial effluents entering the St. Clair R. maxium concentration 5 mg/L. (4)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Recovered from oil refineries as co-products with benzene and toluene. Meta-xylene predominates in commercial xylene which also contains the ortho and para forms plus small amounts of ethylbenzene and toluene (1,6)

Uses: Used primarily to manufacture isophthalic acid which is used to produce plasticisers for plastics and synthetic resins. (1)

OTHER INFORMATION

I Case Studies

REFERENCES


1) Ontario Ministry of the Environment Hazardous Contaminants Programme. Environmental Aspects of Selected Aromatic Hydrocarbons in Ontario: A Comprehensive Background Report. HCP-1-78. Air Resources Branch, Ontario Ministry of the Environment, 135 St. Clair Avenue W., Toronto, Ontario. 1978.

2) Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals.Second Edition Van Nostrand Reinhold Company. Toronto. 1983.

3) Ontario Ministry of the Environment. Water Management, Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment. Water Resources Branch, Ontario Ministry of the Environment, 135 St. Clair Ave. W. Toronto, Ontario. 1978.

4) Ontario Ministry of the Environment. St. Clair River Organics Study, Identification and Quantification of Organic Compounds. Ontario Ministry of the Environment, 135 St. Clair Avenue West, Toronto, Ontario

5) United States National Academy of Sciences. Drinking Water and Health. Safe Drinking Water Committee, National Academy of Sciences. Washington, D.C. 1977.

6) Sittig,Marshall. Hazardous and Toxic Effects of Industrial Chemicals. Noyes Data Corporation. Park Ridge, New Jersey, USA. 1979.

7) United States Department of Health and United States Department of Labor. Occupational Health Guidelines for Chemical Hazards. Publ. No. 81-123. 1981

IDENTIFICATION

I Name ortho-Xylene

Chem. Symbol: $C_6 H_4 (CH_3)_2$ CAS No.: 95-47-6 Date: May 18, 1984

Other Common Names: 1,2-Dimethylbenzene, o-Dimethylbenzene, o-Hylol, 1,2-Methyltoluene o-Xylene

II Physical Chemical Properties

MP: -25.2 °C BP: 144.4°C Solubility: 175 mg/L @ 20°C VP: 5mm @20°C S.G.: 0.880 (2)

$BOD_5$: Biodegrades slowly with acclimated seed. (1)

III Appearance and other properties Clear, colorless, refractive, flammable liquid. Characteristic benzene-like odour. (1)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Undefined tolerance limit (3) Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: Xylenes found in St. Clair River water. (4)

Sediment: Not identified in St. Clair R. sediment. (4)

Biological Organisms: Xylenes identified in St. Clair R. walleye, splake, emerald shiners, black crappie, bluegill and pumpkin seed. Maximum conc.: 330 ug/kg. (4)

III Biological Information

Partition Coef.: 2.77 (2) Threshold Odour: 1.8 ppm (2) Bioaccumulation Factor: Probably low. (9)

Half-Life - Water: 5-6 hrs. at 25°C (evap.)* (5) Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results |
|---|---|---|---|
| 13 mg/L | Goldfish | | 24-hr. LC-50 (2) |
| 100-1000 mg/L | Daphnia magna | | 24-hr. TLm (2) |
| 13.5 mg/L | Rainbow Trout | | 96-hr. LC-50 (2) |

*Incubation with natural flora in groundwater in the presence of other components of high-octane gasoline (100 ul/L): 100% biodegradation after 192 hrs. at an initial concentration of o-Xylene of 1.26 ul/L. (2)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other:

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Rats oral LD-50 4.3 g/kg (8) Half-Life:

Mutagen: Teratogen: Defects in chick embryos. Isomer not stated. (8) Carcinogen:

Mode of Toxic Action: Irritating to eyes and nose at 200 ppm in air. Narcotic effects at 200 ppm. Mild skin irritant. (1)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Recovered from oil refineries as a co-product with benzene and toluene.Xylenes identified in industrial effluents entering the St. Clair R.; maximum concentration 5 mg/L. (1)

Uses: Used primarily to manufacture phthalic anhydride which is used to produce plasticisers for plastics and synthetic resins. (1)

OTHER INFORMATION

I Case Studies

REFERENCES


1) Ontario Ministry of the Environment Hazardous Contaminants Programme. Environmental Aspects of Selected Aromatic Hydrocarbons in Ontario: A Comprehensive Background Report. HCP-1-78. Air Resources Branch, Ontario Ministry of the Environment, 135 St. Clair Avenue W., Toronto, Ontario. 1978.

2) Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals.Second Edition Van Nostrand Reinhold Company. Toronto. 1983.

3) Ontario Ministry of the Environment. Water Management, Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment. Water Resources Branch, Ontario Ministry of the Environment, 135 St. Clair Ave. W. Toronto, Ontario. 1978.

4) Ontario Ministry of the Environment. St. Clair River Organics Study, Identification and Quantification of Organic Compounds. Ontario Ministry of the Environment, 135 St. Clair Avenue West, Toronto, Ontario

5) MacKay, Donald, P J. Leinonea. Rate of Evaporation of Low Solubility Contaminants from Water Bodies to Atmosphere. Environ. Science and Technology, 9(13): 1178-1180. 1975.

6) Metcalf, R. L. and J. R. Sanborn. Pesticides and Environmental Quality in Illinois. Ill. Nat'l Survey Bull. 31:381-436. 1975.

7) United States National Academy of Sciences. Drinking Water and Health. National Academy of Sciences, 2101 Constitution Avenue, Washington, D.C. 20418. 1977.

IDENTIFICATION

I Name para-Xylene

Chem. Symbol: $C_6 H_4 (CH_3)_2$ CAS No.: 106-42-3 Date: May 18, 1984

Other Common Names: p-Xylol; 1,4-Dimethylbenzene; p-Dimethylbenzene; 1,4-Xylene p-Xylene.

II Physical Chemical Properties

MP: -13°C BP: 138.4°C Solubility: 198 mg/L @ 25°C VP: 6.5 mmHg at 20°C S.G.: 0.86 at 20°C (2)

$BOD_5$: Biodegrades slowly with acclimated seed. (1)

III Appearance and other properties Clear, colorless, refractive, flammable liquid. Characteristic benzene-like odor. (1,2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Undefined tolerance limit (4) Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: Xylenes found in St. Clair River water. (5)

Sediment: Not identified in St. Clair R. sediment. (5)

Biological Organisms: Xylenes identified in St. Clair R. walleye, splake, emerald shiner, black crappie, bluegill and pumpkin seed. Maximum conc.: 330 ug/kg. (5)

III Biological Information

Partition Coef.: 3.15 (2) Threshold Odour: 0.53 ppm (2) Bioaccumulation Factor: Probably low. (9)

Half-Life - Water: see * below Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 18 mg/L | Goldfish | - | 24-hr. LC-50 | (2) |
| 28.8-26.7 mg/L | Fathead minnow | soft water | 24-hr to 96-hr LC-50 | (2) |
| 28.8 mg/L | Fathead minnow | hard water | 24-hr to 96-hr LC-50 | (2) |

*Incubation with natural flora in groundwater in the presence of other high-octane gasoline components (100 ul/L): 100% biodegradation in 192 hrs. at 13°C and an initial conc. of p-Xylene of 1.03 ul/L. (2)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other:

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Lethal effects on mice; inhalation at 15-35 mg/L (3450 to 8050 ppm) (8) Half-Life:

Mutagen: Teratogen: Defects in chick embryo. Carcinogen: Isomer not stated. (8)

Exposure Effects: Irritating to eyes and nose at 200 ppm in air. Narcotic effects at 200 ppm. Mild skin irritant. (1)

PARA-XYLENE (cont.)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Organic Trace Contaminants  Lab Specialist: Manager  Phone: 248-3031

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources Xylenes identified in industrial effluents entering the St. Clair R.; maximum concentration 5 mg/l.(4) Organic chemical industry. (7)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: Recovered from oil refineries as co-product with benzene and toluene. (1)

Uses: Used to manufacture terephthalic acid which is used to produce plasticisers for plastics and synthetic resins particularly for polyester fiber manufacture. (1)

OTHER INFORMATION

I Case Studies

REFERENCES


1) Ontario Ministry of the Environment Hazardous Contaminants Programme. Environmental Aspects of Selected Aromatic Hydrocarbons in Ontario: A Comprehensive Background Report. HCP-1-78. Air Resources Branch, Ontario Ministry of the Environment, 135 St. Clair Avenue W., Toronto, Ontario. 1978.

2) Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals.Second Edition Van Nostrand Reinhold Company. Toronto. 1983.

3) Ontario Ministry of the Environment. Water Management, Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment. Water Resources Branch, Ontario Ministry of the Environment, 135 St. Clair Ave. W. Toronto, Ontario. 1978.

4) Ontario Ministry of the Environment. St. Clair River Organics Study, Identification and Quantification of Organic Compounds. Ontario Ministry of the Environment, 135 St. Clair Avenue West, Toronto, Ontario

5) United States National Academy of Sciences. Drinking Water and Health. National Academy of Sciences, 2101 Constitution Avenue, Washington, D.C. 20418. 1977.

6) Metcalf, R. L. and J. R. Sanborn. Pesticides and Environmental Quality in Illinois. Ill. Nat'l Survey Bull. 31:381-436. 1975.

7) Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals. Van Nostrand Reinhold Company. Toronto. 1977.

# PESTICIDES AND AGRICULTURAL CHEMICALS

IDENTIFICATION

I Name ALDICARB

Chem. Symbol: CAS No.: 116-06-3 Date: MARCH 2, 1984

Other Common Names: 2-Methyl-(methylthio)propionaldehyde-O-(methylcarbomyl)-oxime; Temik 10G; Temik 15G.

II Physical Chemical Properties

MP: 98-100°C (1) BP: Decomposes at 100°C (1) Solubility: 4000 ppm at 10°C (1) 6000 ppm at 25°C (1) also see * below VP: $1x10^{-5}$mmHg at 0°C (1) $1x10^{-4}$mmHg at 25°C (1)

S.G.: 1.195 at 25°C (1) $BOD_5$:

III Appearance and other properties White crystalline solid with a slight sulfur odour. Aldicarb belongs to the carbamate family of pesticides (derived from carbamic acid). It is formulated into products, Temik 10G and Temik 15G both of which contain 10% and 15% of aldicarb respectively. (1,3)

* Another reference lists the solubilty as 17ug/L at 25°C. (2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: 1.57 (1) Threshold Odour: Bioaccumulation Factor:

Half-Life - Water: Sediment: See*below and Other Information section Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results |
|---|---|---|---|
| 0.56 mg/L | Rainbow trout | 12°C | 96-hr LC50 (5) |
| 0.05 mg/L | Bluegill sunfish | 24°C | 96-hr LC50 (5) |

* Aldicarb degrades quite rapidly in soils with the evolution of $CO_2$. Under field conditions aldicarb has a half-life of about 7 days in loam soil (metabolites were aldicarb sulfoxide and aldicarb sulfone).(4) The half-life of the metabolites ranges from 14 to 32 days but residues may persist for more than 3 months in soils. (1)
LEACHING-see Other Information section.

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other:

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Oral LD50 (male rat): 10 mg/kg (10% granular formulation) (2)
Oral LD50 (rat): approx. 7 mg/kg (Temik 10%) (4)
Oral LD50 (rat): 0.9 mg/kg (Technical aldicarb) (3)
Dermal LD50 (rabbit): 5.0 mg/kg (Technical aldicarb) (1)
For acute toxity of aldicarb metabolites see Other Information section

Mutagen: negative (aldicdarb and metabolites) (1) Teratogen: negative animal (1) Carcinogen: positive animal (1)

Mode of Toxic Action: Inhibition of the enzyme cholineterase, which regulates the transmission of nerve impulses.(1)

Initial symptoms of cholinesterase inihibition are headache, nausea, drowsiness, salivation, pinpoint pupils, cramps, sweating, and diarrhea. In nature aldicarb is converted to two related compounds, aldicarb sulfoxide and aldicarb sulfone, which are also cholinesterase inhibitors. (1)

Acceptable Daily Intake: 0.001 mg/kg/day. This ADI is calculated on the assumptions that the average human is 70 kg,consumes 2 litres of water per day and 20% of the total intake of aldicarb is from water

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticides Lab Specialist: Manager Phone: 248-3846

Others:

II Detection Limits

Water: Biological:

Sediment: Other:

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced: Consumed: Discharge: Air: Water: Land: 22,600 kg (7)

Other Sources:

Uses: A registered systematic insecticide and acracide for soil use in Canada. Aldicarb is used in the protection of cotton, sugar beets, potatoes, peanuts, ornamentals, sweet potatoes, oranges, pecans, dry beans and soybeans. (3) In Ontario aldicarb has been used exclusively on potatoe crops, chrysanthemums and poinsettias.

OTHER INFORMATION

The metabolites of aldicarb persist for a longer period of time than aldicarb and are of concern because of their toxicity. The breakdown (transformation) of aldicarb in plants, animals and soils, basically follows a similar pattern. The main metabolites of aldicarb are aldicarb sulfoxide and aldicarb sulfone. (1)

Leaching: Leaching of aldicarb in Houston clay and Lufkin sandy loam is insignificant, but it appears to move more freely through columns of coarse sand. (4)

Toxicity of Metabolites: Oral LD50 (rat): 0.88 mg/kg aldicarb sulfoxide. (1)
Oral LD50 (rat): 25 mg/kg aldicarb sulfone. (1)

REFERENCES


1. State of Wisconsin, Department of Agriculture, Trade and Consumer Protection. Environmental Impact Statement for Rules Relating to Special Restrictions On the Use In Wisconsin of Pesticides Containing Aldicarb. (Proposed s. Ag 29.17, Wis. Adm. Code).
2. Canada, Department of Agriculture, Research Branch. Guide To The Chemicals Used In Crop Protection. E.Y. Spencer, Research Centre, University Sub Post Office, London, Ontario. Publication 1093, Seventh Edition. December 1981.
3. Farm Chemicals Handbook 1980. Meister Publishing Company, Willoughby, Ohio.
4. Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals. Second Edition Van Nostrand Reinhold Company. Toronto. 1983.
5. United States Department of the Interior, Fish and Wildlife Service. Handbook of Acute Toxicity to Fish and Aquatic Invertebrates. W.W. Johnson and M. T. Finley. Resource Publication 137 Washington, D. C. 1980.
6. United States National Academy of Sciences. Drinking Water and Health. Safe Drinking Water Committee, National Academy of Sciences. Washington, D.C. 1977.
7. Ontario Ministry of Agriculture and Food. Survey of Pesticide Use in Ontario, 1978. Economics Branch, Ontario Ministry of Agriculture and Food. Legislative Buildings. Toronto, Ontario. M7A 1B6.

IDENTIFICATION

I Name Aldrin

Chem. Symbol: $C_{12}H_8Cl_6$ CAS No.: 309-00-2 Date: May 25, 1984

Other Common Names: 1,2,3,4,10,10-hexachloro-1,4,41,5,8,81-hexahydro-1,4-endo, exo-5,8-dimethanonapthalene; Alarite; Aldrex; Aldrine; Aldrosol, Algram, Compound 118; Drinox; HHDN; Octalene;Seedrin Liquid; Soidrin (1).

II Physical Chemical Properties

MP: 104-105.5°C BP: 49-60°C (Tech. grade)(12) Solubility: 27 ug/L (1) 10 ug/L (12) VP: $2.3 \times 10^{-5}$mmHg at 20°C (Tech. grade) (12) S.G.:

$BOD_5$:

III Appearance and other properties Brown solid or solution with mild chemical odour. (2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 0.001 ug/l unfiltered (3) Others: 0.01 ug/l (1)

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: Threshold Odour: 0.017ppm (12) Bioaccumulation Factor: 1,000 to 10,000 (4)

Half-Life - Water: see * below Sediment: see ** below Fish:

Synergistic, Additive, Antagonistic Factors: Most organisms convert aldrin to dieldrin which is similar in toxicity to the parent compound. (5)

| Toxicity Testing: Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 16 ug/L | Fathead Minnow | - | 96-hr. LC50 | (5) |
| 7.9 ug/L | Bluegill Sunfish | - | 96-hr. LC50 | |
| 8.5 ug/L | Green Sunfish | - | 96-hr. LC50 | |
| 0.2 ug/L | Immature Stonefly | - | 96-hr. LC50 | |

*Calculated half-life of 185 hrs. in 1m of water at 25°C (based on an evap. rate of $3,720 \times 10^{-3}$m/hr). (12)
**75-100% disappearance from soils: 1-6 years. (12)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: 0.0007 mg/l* (11) Other: 0.001 mg/l total concentration (U.S. NAS/NAE) (1)

Fish Consumption:

Tolerance Limits in Other Foodstuffs: 0.2 ppm max. acceptable residues (calculated on fat content) in meat and meat by-products, poultry and sheep, and 0.1 ppm (calculated on fat content) in dairy products. (5)

II Effects

Acute Toxicity: 67 mg/kg (LD50) in rats (oral) (8)
98-7200 mg/kg (LD50) in rats (dermal)(8) Half-Life:

Mutagen: Teratogen: positive (9) Carcinogen: potential in animals (9)

Mode of Toxic Action:

*The MOE drinking water objective of 0.0007 mg/L includes aldrin and dieldrin

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticide Section Lab Specialist: G.A. Rees Phone: 248-3846

Others:

II Detection Limits

Water: 0.001 to 0.02 ug/L (10) Biological: 0.001 to 0.02 ug/g (10)

Sediment: 0.001 to 0.02 ug/g (10) Other: vegetation 0.001 to 0.02 ug/g (10)

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced: Consumed: Discharge: Air: Water: Land:

Other Sources:

Uses: Used primarily to control soil insects. Pest control uses include termites around buildings (8)

OTHER INFORMATION

I Case Studies

REFERENCES


1) Canada, Department of the Environment. Water Quality Sourcebook. A Guide to Water Quality Parameters. Inland Waters Directorate, Water Quality Branch, Ottawa, Canada, 1979.

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8) Farm Chemicals Handbook 1980. Meister Publishing Company, Willoughby, Ohio.

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IDENTIFICATION

I NAME Atrazine

Chem. Symbol: CAS #: 1912-24-9 Date: March 4, 1984

Other Common Names: 2-Chloro-4-ethylamino-6-isopropylamino-s-triazine; 2-Chloro-4-ethylamino-6-isopropylamino-1,3,5-triazine; Gesaprim; Primatol; Atred.

II Physical Chemical Properties

MP: 173-175°C(1) BP: Solubility: 70 ppm at 25°C(1) VP: $3 \times 10^{-7}$mmHg at 20°C(1) S.G.:
33 ppm at 25°C(2)

$BOD_5$:

III Appearance and other properties: Colourless crystals. It is stable in neutral, slightly acidic or slightly basic media, but alkali or mineral acids at higher temperatures hydrolyze it to the herbicidally - inactive hydroxy derivative (see Other Information section). (2) Atrazine is a triazine herbicide.

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Table 3 (Substance With Undefined Tolerance Limits). (3) Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario:

Water: 11 agricultural watersheds tested in S.W. Ontario (May, 1975-April 1977) concentrations of atrazine were ND in 19.8% of the samples and averaged 1.4 ppb (0.26 ppb diethylated atrazine and 1.14 atrazine) in the remaining samples. (7)

Sediment:

Biological Organisms:

III Biological Information:

Partition Coef.: Threshold Odour: Bioaccumulation Factor: 3-10(fish); 10-83(algae)(1)

Half-Life - Water: Sediment: see * below, also see Other Information Section. Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing; Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 5.4-8.4 mg/L | Bluegill sunfish | 27°C | 2 year TLm | (1) |
| 0.09 mg/L | Bluegill sunfish | 27°C | Maximum acceptable toxicant concentration (MATC) | (1) |
| 11-20 mg/L | Fathead minnow | 25°C | 1 year TLm | (1) |
| 0.21 mg/L | Fathead minnow | 25°C | Maximum acceptable toxicant concentration (MATC) | (1) |
| 4.0-6.0 mg/L | Brook trout | 9-16°C | 1.5 year TLm | (1) |
| 0.06 mg/L | Brook trout | 9-16°C | Maximum acceptable toxicant concentration (MATC) | (1) |

Slightly toxic to fish. (2)
*In aquatic sediments 0.005% of atrazine-$^{14}C$ was recovered as $^{14}CO_2$ (from ring labeled atrazine) after 90 days (1)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E: Other:

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: Oral LD50(rat): approx. 1869-3080 mg/kg (2)
Oral LD50(rat): 1780 mg/kg (tech. atrazine) (4)
Oral LD50(mice): 1750 mg/kg (2)
Dermal LD50(rabbits): 7500 mg/kg (2)

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action:

Rats fed for 2 years at dietary levels of 100 and 1,000 ppm showed no observeable toxic effect. (1)

Acceptable Daily Intake: 0.215 mg/kg/day (based on the assumption that the average adult human weighs 70 kg and consumes 2 litres of water per day). (5)

ATRAZINE (cont.)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticide Lab Specialist: Manager Phone: 248-3846

Others:

II Detection Limits

Water: Biological:

Sediment: Other:

SOURCES AND USES

I Industrial and Commerical Sources:

Amt. Produced: Consumed: Discharge: Air: Water: Land: 1,419,430 kg(6

Other Sources:

Uses: Used as a preemergent and postemergent herbicide for seasonal-long weed control in corn, sorghum and certain other crops. At highest rates it is used for non-selective weed control in non-cropped areas. (4) Based on 1978 figures (see reference 6) the use of atrazine greatly out weighs the use of any other pesticide in Ontario.

OTHER INFORMATION

Chemical hydrolysis of atrazine to hydroxyatrazine is the principal pathway of detoxification in soil.(1) 48% to 85% of atrazine was hydrolyzed in 30 days, depending on soil type. (1)
75-100% disappearance from soils: 10 months (1)

REFERENCES


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2) Canada, Department of Agriculture, Research Branch. Guide To The Chemicals Used In Crop Protection. E.Y. Spencer, Research Centre, Research Centre, University Sub Post Office, London, Ontario. Publication 1093, seventh Edition. December 1981.

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5) United States National Academy of Sciences. Drinking Water and Health. Safe Drinking Water Committee, National Academy of Sciences. Washington, D.C. 1977.

6) Ontario Ministry of Agriculture and Food. Survey of Pesticide Use in Ontario, 1978. Economics Branch, Ontario Ministry of Agriculture and Food. Legislative Buildings. Toronto, Ontario. M7A 1B6.

7) Canada, Department of Agriculture. Ontario Ministry of Agriculture and Food. Ontario Ministry of the Environment. Agricultural Watershed Studies in the Canadian Great Lakes Drainage Basin. Task Group C (Canadian Section) Activity 1 International Reference Group on Great Lakes Pollution from Land Use Activities. May 1, 1978.

IDENTIFICATION

I Name Chlordane

Chem. Symbol: $C_{10}H_6Cl_8$ CAS #: (Trans) 5103-71-9; (Cis) 5103-74-2 Date: May 25, 1984

Other Common Names: 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7a hexahydro-4,7,methanoidene, Aspon; Belt; Chlordan; Chlorogran; Chloro-Kill; Chlordano; Corodane; Kryphor; Penicklor; Prentox; Octachlor; Octa-Klor; Synklor; Topiclor 20; (1)

II Physical Chemical Properties

MP: BP: 175°C at 2mmHg Solubility: 6-9 ug/l VP: 1x10 mmHg S.G.: 1.65 at 16°C (2)

$BOD_5$:

III Appearance and other properties Colourless to pale yellow liquid (pure Chlordane). Technical grade chlordane is a viscous amber coloured liquid with a cedar-like odour and is relatively non-volatile. Chlordane is a organochlorine insecticide. Technical grade chlordane is a mixture of various chlorinated hydrocarbons. Two major components of this mixture are trans (gamma) chlordane and cis (alpha) chlordane. (2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 0.06 ug/l unfiltered (3) Others: 0.01 ug/l U.S. EPA (1)

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: 11 Agricultural Watersheds tested in S.W. Ontario (May 1975 - April 1977) concentrations of chlordane were ND in 98.4% of the samples and in the remaining samples the concentrations were 0.4ng/L (4)

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: Threshold Odour: 2.5ppb (15) Bioaccumulation Factor: 1,000-3,000 (fish) (5) 2,000-6,000 (invertebrates)

Half-Life - Water: Sediment: See * below Fish:

Synergistic, Additive, Antagonistic Factors: Endrin and carbon tetrachloride have synergistic effects on chlordane toxicity. Parathion exhibits an antogonistic effect on the toxicity of chlordane. (2)

Toxicity Testing:

| Concentration | Species | Test Water | Remarks |
|---|---|---|---|
| .052 mg/L | Fathead Minnow | soft water | 96-hr TLm (6) |
| .069 mg/L | Fathead Minnow | hard water | 96-hr TLm |
| .047 mg/L | Trout (Brook) | | 96-hr $LC_{50}$ |
| .005 mg/L | Pike | | Distress 24 hrs. |
| .05 mg/L | Pike | | 100% mortality 24 hrs. |

Chlordane is persistent and subject to bioaccumulation in the food chain. (6)

*75-100% disappearance from soils: 3-5 years. (15)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: 0.007 mg/l (14) Other: 0 U.S. EPA (1)

Fish Consumption:

Tolerance Limits in Other Foodstuffs: 0.1 ppm (calculated on fat content) in dairy products, meat by-products, poultry and sheep. (8)

II Effects

Acute Toxicity: Oral LD50(rat): 457-590 mg/Kg (15) Half-Life:

Mutagen: Teratogen: positive in rats (2) Carcinogen: potential animal (9)

Mode of Toxic Action:

Chlordane fed to rats at 2.5 mg/Kg in the diet caused slight liver damage. (2) Chlordane is readily degraded in homeotherms and therefore not readily accumulated. (13)

CHLORDANE (cont.)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticide Section  Lab Specialist: G.A.V. Rees  Phone: 248-3048

Others:

II Detection Limits

Water: 0.001 to 0.02 ug/L (10)  Biological: 0.001 to 0.02 ug/g (10)  Air:

Sediment: 0.001 to 0.02 ug/g (10)  Other: vegetation 0.001 to 0.02 ug/g (10)

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land: 940 kg (1978) (11)

Other Sources:

Uses: The oil solution type formulation of chlordane is used almost exclusively for subterranean termite control applications, and emulsifiable concentrates, granules, dusts, and wettable powders for termite control and some agricultural purposes. (11)

OTHER INFORMATION

I Case Studies

REFERENCES


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11) Ontario Ministry of Agriculture and Food. Survey of Pesticide Use in Ontario, 1978. Economics Branch, Ontario Ministry of Agriculture and Food. Legislative Buildings. Toronto, Ontario. M7A 1B6.

12) Farm Chemicals Handbook 1980. Meister Publishing Company, Willoughby, Ohio.

13) Canada National Research Council. Chlordane: Its Effects On Canadian Ecosystems And Its Chemistry. National Research Council of Canada, Associate Committee on Scientific Criteria for Environmental Quality. Ottawa, Ontario. NRCC 14094.

14) Ontario Ministry of the Environment

IDENTIFICATION

I Name Chlorpyrifos

Chem. Symbol: $C_9 H_{11} Cl_3 NO_3 PS$ CAS #: Date: May 2, 1985

Other Common Names: O,O-diethylo-3,5,6-trichloro-2-pyridyl phosphorothioate; Dowco-179; Dursban; Lorsban. (1)

II Physical Chemical Properties

MP: 41.5-43.5 °C (2) BP: Solubility: 0.4ppm at 23°C (10) VP: $1.87 \times 10^{-5}$mmHg at 20°C (10) S.G.: 1.398 at 43.5°C (liquid) (10)

$BOD_5$:

III Appearance and other properties White granular crystal. Organophosphorus insecticide. (2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 0.001 ug/l unfiltered (3) Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: 11 Agricultural Watersheds in S.W. Ontario-chloropyrifos concentrations were ND in 99.7% of the samples tested and ranged between 0.11 to 10 ng/L in the remaining samples. (4)

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: 5.11 (10) Threshold Odour: Bioaccumulation Factor:

Half-Life - Water: see * below Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 11 ug/L | Rainbow Trout | - | 96hr LC50 | (10) |
| 0.26 mg/L | Mosquito fish | - | 72hr LC50 | (10) |

*Hydrolysis in buffered distilled water: half-lifes of 22.8 days (pH 8.1); 35.8 days (pH 6.9); 62.7 days (pH 4.7). (10)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: 0.1 mg/l Canada 1972 (5) Other:

Fish Consumption:

Tolerance Limits in Other Foodstuffs: Max. acceptable concentrations in meat and meat by-products and in fat, kidney and liver of cattle is 1 ppm. (6)

II Effects

Acute Toxicity: 97-276 mg/kg (LD50) in rats (oral) (2) Half-Life:
72000 mg/kg (LD50) in rabbits (dermal) (2)

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action: Active ingredient is a chlorinesterase inhibitor. (7)

CHLORYRIFOS CON'T

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticides  Lab Specialist: G.A.V. Rees  Phone: 248-3031

Others:

II Detection Limits

Water: 0.01 to 0.10 ug/l (8) Biological: 0.001 to 0.01 ug/g (veg'n) (8) Air:

Sediment: 0.001 to 0.01 ug/g (8) Other: 0.01 to 0.10 (Industrial Wastes) (8)

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land: 23,000 kg (1978) (9)

Other Sources:

Uses: Used as a soil insecticide for control of wire worms, corn rootworms and cutworms, as a dormant application for control of peach tree borer and as a slurry seed treatment for control of seed corn maggot. Foliar application of cutworms on corn. (2)

OTHER INFORMATION

I Case Studies

REFERENCES


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2) Farm Chemicals Handbook 1980. Meister Publishing Company, Willoughby, Ohio.

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5) Canada Department of Environment. Guidelines for Surface Water Quality. Vol. 1 Inorganic Chemical Substances: Preamble. Inland Waters Directorate, Water Quality Branch, Ottawa, Canada, 1979.

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IDENTIFICATION

I Name 2,4-D

Chem. Symbol: $C_{10}H_{10}Cl_2O_3$ CAS #: 75-99-0 Date: May 25, 1984

Other Common Names: γ-(2,4-Dichloropehnoxy)butyric acid; Butoxone SB; Butyrac; Embutox

II Physical Chemical Properties

MP: BP: Solubility: Insoluble (1) VP: S.G.:

$BOD_5$:

III Appearance and other properties Crystalline with a characteristic salty taste. Selective cyclohexene herbicide. (2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 4.0 ug/l unfiltered (3) Others: 4.0 ug/l (4)

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: Threshold Odour: Bioaccumulation Factor:

Half-Life - Water: Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results |
|---|---|---|---|
| 390-395 mg/L | Red-sided shiners | Hard & soft waters 21°C | 96-hr TLM(2) |
| 1000 mg/L | Largemouth Bass | aerated solutions 20°C | 48-hr TLM |
| 340 mg/L | Coho Salmon | aerated solutions 20°C | 48-hr TLM |

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other:

Fish Consumption:

Tolerance Limits in Other Foodstuffs: 1-15 ppm max. residue limits in fruits and vegetables. (5)

II Effects

Acute Toxicity: 970 mg/kg (LD50) in female rat (oral) (6) Half-Life:
7570 mg/kg (Na salt) LD50 in female rat (oral) (6)

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action:

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticide Section  Lab Specialist: G.A.V. Rees  Phone: 248-3031 (8)

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources:

Uses: A herbicide used for the control of cattails and a variety of grasses. It is applied in a spray to non-crop lands at 20 to 40 lbs/acre. It is also used in combination with amitrol. (2)

OTHER INFORMATION

I Case Studies

REFERENCES

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2) California State Water Resources Control Board. Water Quality Criteria. Edited by J.E. McKee and H.W. Wolf. Revised 1963. Publishing Number 3-A.

3) Ontario Ministry of the Environment. Water Management, Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment. November, 1978.

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6) Farm Chemicals Handbook 1980. Meister Publishing Company, Willoughby, Ohio.

7) Ontario Ministry of Agriculture and Food. Survey of Pesticide Use in Ontario, 1978. Economics Branch, Ontario Ministry of Agriculture and Food. Legislative Buildings. Toronto, Ontario. M7A 1B6.

8) Ontario Ministry of the Environment. Outlines of Analytical Methods. Coordinated by Water Quality Section. Labratory Services Branch, June 1981.

IDENTIFICATION

I Name 2,4-DB

Chem. Symbol: $C_8H_6Cl_2O_3$ CAS #: 94-75-7 Date: May 25, 1984

Other Common Names: 2-4, Dichlorophenoxyacetic Acid; Agrotect; Amoxone; Aqua-Keen; Chipco Turf Herbicide D; Chloroxone; Crop Rider; D50; Dacamine; Ded-Weed; Dormone; Esteron; Esterone; Fernesta; Fernamine; Fernoxone; Formula 40; Hedonal Lawn keep; Macondry; Miracle; Pennamine D; Planotox; Plantgard; Salvo; Tributon; U46; Vergomaster; Verlon 2D; Visko-Rhap Lox Volatile 4L. (1)

II Physical Chemical Properties

MP: 136-140°C (11) BP: 160°C (2) Solubility: 890 mg/L at 25°C (11) S.G.: 1.416 (powder) at 25°C (11)

$BOD_5$:

III Appearance and other properties White crystals; ordourless when pure; Phenoxy Herbicide. (2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 4.0 ug/l unfiltered (3) Others: 4.0 ug/l U.S. NAS/NAE (1)

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: 2.81 (11) Threshold Odour: 3.13ppm (11) Bioaccumulation Factor: 7 to 55 (4)

Half-Life - Water: Sediment: see * below Fish: probably less than 2 days (4)

Synergistic, Additive, Antagonistic Factors: At usual application rates 2-4,D has no adverse effects on soil micro organisms. (5)

| Toxicity Testing: Concentration | Species | Test Water | Results |
|---|---|---|---|
| 75 mg/L | Perch | - | Toxicity Threshold (6) |
| 350 mg/L | Largemouth Bass | - | 24 hr TLm |
| 350 mg/L | Bluegill | - | 24 hr TLm |
| 1.0 mg/L | Bluegill | - | 40% killed fingerlings-esters & amines* |
| 5.0 mg/L | Bluegill | - | 100% killed fingerlings-esters & amines* |

* amines and esters of 2,4-D are more toxic than 2,4-D itself

*26 days for ring cleavage in soil suspension. (11)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: 0.1 mg/l (7) Other: 0.1 mg/l total (HWC) (8)

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: 370 mg/kg LD50 (acid) in rats (oral) (5)
500-1200 mg/kg LD50 esters in rats (oral) (5)

Half-Life: 3.1 hours in rat plasma (4)
11.7 hours in human plasma (4)

Mutagen: Teratogen: in mice (4) Carcinogen:

Mode of Toxic Action:

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticide Section  Lab Specialist: G.A.V. Rees  Phone: 248-3031

Others:

II Detection Limits

Water: 0.05 to 0.20 ug/l (9)  Biological: 0.05 to 0.20 ug/g (9)  Air:

Sediment: 0.05 to 0.20 ug/g (9)  Other: 0.05 to 0.20 ug/l (Sewage and Industrial waste) (9)

SOURCES AND USES

I Industrial and Commerical Sources: The Dow Chemical Company. (4)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land: 30,340 kg (1978) (10)

Other Sources:

Uses: Macrophyte control in lakes and ponds at 22-45 lbs/ha and along ditches and irrigation networks.

OTHER INFORMATION

I Case Studies

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11) Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals.Second Edition Van Nostrand Reinhold Company. Toronto. 1983.

IDENTIFICATION

I Name Diazinon

Chem. Symbol: $C_{12}H_{21}N_2O_3$ CAS #: 333-41-5 Date: May 25, 1984

Other Common Names: O, O-diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate; Alfa-tox; Basudin; Dazzel; Diazajet; Diazide; Diazitol; G24480; Gardentox; Neocidol; Nucidol; Saralex; Sarolex; Spectracide (1)

II Physical Chemical Properties

MP: BP: decomposes above 120°C Solubility: 40 mg/L at room temp. (1) VP: S.G.: 1.116

$BOD_5$:

III Appearance and other properties A colourless oil. The technical product is a pale to dark brown liquid of at least 90% purity. Diazinon is an organophosphorus insecticide and its formulations contain sulfotepp as an impurity (1.4-6.9ppm). (2,12)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 0.08 ug/L unfiltered (3) Others: 0.08 ug/L Gr. Lakes Water Quality Board (1)

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: 11 Agricultural Watersheds were tested in S.W. Ontario. Diazinon concentrations were ND in 90.9% of the samples and averaged 0.49 ng/L in the remaining samples. (4)

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: Threshold Odour: Bioaccumulation Factor:

Half-Life - Water: Sediment: 12 weeks general persistance (8) Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: | Concentration | Species | Test Water | Results | |
|---|---|---|---|---|---|
| | 4.3 ug/L | Water flea | - | immobilization in 50-hrs. | (5) |
| | 400 ug/L | guppy | - | death in 24 to 48-hrs. | (5) |
| | 52 ug/L | Bluegill Sunfish | - | 24-hr. LC50 | (12) |
| | 380 ug/L | Rainbow Trout | - | 24-hr. LC50 | (12) |
| Technical Grade | 10.3 ug/L | Fathead Minnow | - | 96-hr. LC50 | (12) |
| Technical Grade | 0.12 ug/L | Bluegill Sunfish | - | 96-hr. LC50 | (12) |
| Technical Grade | 1.35 ug/L | Rainbow Trout | - | 96-hr. LC50 | (12) |

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: 0.014 mg/L (11) Other: 0.014 mg/L MAC (HWC) (6)

Fish Consumption:

Tolerance Limits in Other Foodstuffs: max. acceptable residues on fruits and vegetables range from 0.5 ppm to 0.75 ppm. (7)

II Effects

Acute Toxicity: 300-400 mg/kg (LD50) in rats (oral) (2)
3600 mg/kg (LD50) in rabbits (dermal) (2)
Half-Life:

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action: Inhibition of acetylcholinesterase. (5)

DIAZINON (cont.)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticide Section  Lab Specialist: G.A.V. Rees  Phone: 248-3846

Others:

II Detection Limits

Water: 0.001 to 0.10 ug/L (9)  Biological:  Air:

Sediment: 0.001 to 0.01 ug/g (9)  Other: vegetation 0.001 to 0.01 ug/g (9)

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land: 11,820 kg (1978) (10)

Other Sources:

Uses: Used for the control of soil insects, such as cutworms, wire worms, and maggots. Also effective against many pests of fruits, vegetables, tobacco, forage, field crops, range, pasture, grasslands and ornamentals. It is used extensively in controlling cockroaches and many other household insects; grubs and nematodes in turf; seed treatment and fly control. (2)

OTHER INFORMATION

I Case Studies

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2) Farm Chemicals Handbook 1980. Meister Publishing Company, Willoughby, Ohio.

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10) Ontario Ministry of Agriculture and Food. Survey of Pesticide Use in Ontario, 1978. Economics Branch, Ontario Ministry of Agriculture and Food. Legislative Buildings. Toronto, Ontario. M7A 1B6.

11) Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals.Second Edition Van Nostrand Reinhold Company. Toronto. 1983.

IDENTIFICATION

I Name Endolsulphan

Chem. Symbol: $C_9H_6Cl_6O_3S$ CAS #: 115-29-7 Date: May 25, 1984

Other Common Names: 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-6,9-methano-2,3,4-benzodioxathiepin-3-oxide; Benzoepin; Beosit; Chlorothiepin; Cyclodan; FMC5462; Hoe 2671; Insectophene; Kopthiodan; Malix; NTA 4562; Thimul; Thiodan; Thioden, Thiofar; Thionex (1)

II Physical Chemical Properties

MP: 70-100 °C (2) Solubility: 0.2 mg/L (2) S.G.: 1.745 at 20°C (2)

$BOD_5$:

III Appearance and other properties Light to dark brown crystalline solid with a terpene - like odour. Technical grade endosulfan is composed of 2 stereoisomers referred to as alpha and beta, with melting points of 108 and 206°C. (2,13)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 0.003 ug/l unfiltered (3) Others: 0.003 ug/l U.S. EPA (1976) (1)

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: 11 Agricultural Watersheds tested in S.W. Ontario (May 1975 - April 1977). Concentrations of endosulfan were ND in 80.7% of the samples tested and in the remaining samples concentrations ranged from 0.4 - 101 ng/L (4)

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: 3.55; 3.62 (12) Threshold Odour: Bioaccumulation Factor:

Half-Life - Water: 1 week-5 months (depending on pH and $[O_2]$) (2) Sediment: Fish: 3 days (2)

Synergistic, Additive, Antagonistic Factors: The aquatic toxicity of endosulfan increases significantly with increasing temperature. (5)

Toxicity Testing:

| Concentration | Species | Test Water | Remarks |
|---|---|---|---|
| 1.3 ug/L | Rainbow Trout | 1.6°C | 24-hr. LC50 (6) |
| 6.1 ug/L | Rainbow Trout | 7.2°C | 24-hr. LC50 |
| 3.2 ug/L | Rainbow Trout | 12.7°C | 24-hr. LC50 |
| 1.7 ug/L | Rainbow Trout | 7.2°C | 96-hr. LC50 |
| 1.5 ug/L | Rainbow Trout | 12.7°C | 96-hr. LC50 |
| 2.6 ug/L | Rainbow Trout | 1.6°C | 96-hr. LC50 |

Freshwater fish species are in general more sensitive to endosulfan than are invertebrate species. Endosulfan is one of the most toxic pesticides to fish (5).

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other:

Fish Consumption:

Tolerance Limits in Other Foodstuffs: 2.0 ppm in fruits and some vegetables (broccoli, brussel sprouts cabbage, lettuce, spinach), 0.1ppm in dairy products, meat, poultry, hogs and sheep (calculated on fat content. (7)

hogs and sheep (calculated on fat

II Effects

Acute Toxicity: 218 mg/kg (LD50) in rats (male) (2) Half-Life:
300 mg/kg (LD50) in rabbits (male) (2)

Mutagen: negative (rats) (2) Teratogen: negative (rats) (2) Carcinogen: negative (human) (8)

Mode of Toxic Action:

I Analytical Source

ENVIRONMENTAL DETECTION

M.O.E. Lab.: Pesticide Section  Lab Specialist: G.A.V. Rees  Phone: 248-3031

Others:

II Detection Limits

Water: 0.001 to 0.02 ug/L (9)  Biological: 0.001 to 0.02 ug/g (9)  Air:

Sediment: 0.001 to 0.02 ug/L (9)  Other: Vegetation 0.001 to 0.02 ug/g (9)

SOURCES AND USES

I Industrial and Commerical Sources: Hooker Chemical Corporation, Agricultural Chemical Group (Thiodan) a registered trademark of Canadian Hoechst; HOE 2671). (10)

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land: 18,280 kg (1978) (11)

Other Sources:

Uses: Controls aphids, thrips, beetles, foliage-feeding larvae, mites, borers, cutworms, boll worm, whiteflies, leafhoppers and slugs on deciduous trees, vegetables, forage crops, grains, forest ornamentals. Also controls termites (10)

OTHER INFORMATION

I Case Studies: Osmond, D.S., 1969. A fish kill in the Thames River, Ontario. Unpublished report. Ontario Ministry of the Environment, London, Ontario.

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7) Canada Department of Health and Welfare. Food and Drugs Act and Regulations. Minister of Supply and Services Canada 1981.

8) State of Michigan, Critical Materials Register 1979. Publication Number 4833-5323 Environmental Services Division, Michigan Department of Natural Resources. P.O. Box 30028, Lansing, Michigan, 48909.

9) Ontario Ministry of the Environment. Outlines of Analytical Methods. Coordinated by Water Quality Section. Labratory Services Branch, June 1981.

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IDENTIFICATION

I Name Guthion

Chem. Symbol: $C_{10}H_{12}N_3O_3PS_2$ CAS #: Date: May 25, 1984

Other Common Names: O,O-Dimethyl S-[(4-oxo-1,2,3-benzotriazin-3 ((4H)-yl) methyl] phosphorodithioate; Azinphosmethyl

II Physical Chemical Properties

MP: 73°C (1) BP: Solubility: approx. 25 mg/l at 25°C (1) 29ppm at 25°C (7) VP S.G.: 1.44 at 20°C (7)

$BOD_5$:

III Appearance and other properties Brown waxy solid. Subject to hydrolysis. Decomposes at elevated temperatures with gas evolution. Belongs to the Organophosphorus group of insecticides. (1)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 0.005 ug/l (2) Others: 0.01 ug/l U.S. EPA (1976) (3)

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: Threshold Odour: 0.2ppb (detection) (7) Bioaccumulation Factor: Apparently no significant bio. accum. through the food chain. (4)

Half-Life - Water: 1.2 days (pond water) (4) Sediment: Fish: Less than a week (4)

Synergistic, Additive, Antagonistic Factors:

Toxicity Testing:

| Concentration | Species | Test Water | Remarks | |
|---|---|---|---|---|
| 4 ug/L | Brown Trout | | 96-hr LC50 | (4) |
| 3.2 ug/L | Rainbow Trout | | LC50 | (4) |
| 13 ug/L | Yellow Perch | | LC50 | (4) |
| 4 to 4270 ug/L | various fish species | | 96-hr LC50 | (5) |
| 0.10 to 22.0 ug/L | various invertebrate species | | 96-hr LC50 | (5) |

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other: 0.1 mg/l total U.S. NAS/NAE (3)

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: 13-16 mg/kg LD50 in rats (oral)(1)
220 mg/kg LD50 in rat (dermal) (1)

Half-Life: 2 wks. to a year in soils depending on water content and temperature. (4)

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action: Inhibition of acetylcholinesterase. (4)

GUTHION (cont.)

I Analytical Source

ENVIRONMENTAL DETECTION

M.O.E. Lab.: Pesticide Section  Lab Specialist: G.A.V. Rees  Phone: 248-3031

Others:

II Detection Limits

Water: 0.001 to 0.02 ug/l (6)  Biological: 0.001 to 0.02 ug/g (6)  Air:

Sediment: 0.001 to 0.02 ug/g (6)  Other: 0.001 to 0.02 ug/l (sewage and Industrial Wastes) (6)

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SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources:

Uses: To protect fruit, grain and vegetable products in the agricultural industry as well as shrubs and and trees from many insect pests. (1)

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OTHER INFORMATION

I Case Studies

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REFERENCES


1) Farm Chemicals Handbook 1980. Meister Publishing Company, Willoughby, Ohio.

2) Ontario Ministry of the Environment. Water Management, Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment. November, 1978.

3) Canada Department of Environment. Guidelines for Surface Water Quality. Vol. 1 Inorganic Chemical Substances: Preamble. Inland Waters Directorate, Water Quality Branch, Ottawa, Canada, 1979.

4) Ontario Ministry of the Environment. Rationale for the Establishment of Ontario's Provincial Water Quality Objectives. September, 1979.

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IDENTIFICATION

I Name Hexachlorocyclohexane

Chem. Symbol: $C_6 H_6 Cl_6$ CAS No.: 608-73-1 (Technical BHC) Date: May 2, 1985

Other Common Names: 1,2,3,4,5,6-Hexachlorocyclohexane; Benzene Hexachloride; BHC; HCCH; HCH.

II Physical Chemical Properties

| | | | | | |
|---|---|---|---|---|---|
| MP: | $\alpha$158°C (1) | BP: $\alpha$288°C de- | Solubility: $\alpha$10 mg/L; (1) | VP: $\alpha$0.00087mmHg (1) | S.G.: 1.87 at 20°C (2) |
| | $\beta$312°C | composes; | $\beta$ 5 mg/L; | $\beta$ 0.000014mmHg | |
| | $\gamma$112.5°C | $\beta$sublimes (2) | $\gamma$ 10 mg/L; | $\gamma$ 0.0008mmHg | |
| | $\delta$138°C | | $\delta$ 10 mg/L | | |

III Appearance and other properties Hexachlorocyclohexane is a brownish-to-white crystalline solid with an odour of new mown hay or green corn. Hexachlorocyclohexane is commonly referred to as BHC. Technical grade BHC contains a mixture of HCH isomers in the following amounts: $\alpha$ -isomer, 55-70%; $\beta$-isomer, 6-8%; $\gamma$ -isomer, 10-18%; $\delta$-isomer, 3-4%; $\epsilon$-isomer in trace amounts. (1) For information on $\gamma$-BHC (Lindane) refer to the sheet on Lindane.

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: Both $\alpha$ and $\beta$-BHC were detected in trace amounts in the Niagara River. (3)

Sediment: $\alpha$-BHC 110 ppb in sediment from the Niagara River. (3)

Biological Organisms: $\alpha$-BHC 3.3 ppb, $\beta$-BHC 430 ppb in biota from the Niagara River. (3)

III Biological Information

Partition Coef.: 3.79-3.82 (4) Threshold Odour: Bioaccumulation Factor: Low. 60-500 in aquatic organisms.* (5)

Half-Life - Water: 7 days to 4 years ** (5) Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: | Concentration | Species | Test Water | Results | |
|---|---|---|---|---|---|
| Technical BHC | 680 ug/L | Daphnia pulex | 16°C | 48-hr. EC50 | (9) |
| Technical BHC | 18 ug/L | Rainbow Trout | 13°C | 96-hr. LC50 | (9) |
| Technical BHC | 125 ug/L | Fathead Minnow | 18°C | 96-hr. LC50 | (9) |

Acute toxicity of a BHC isomer mixture to freshwater aquatic life occurs at 100 ug/L (may be lower in sensitive species). (1)

* Once the exposure has ceased the bioaccumulation process is reversed. (5)

** Hexachlorocyclohexane does not photolyze, oxidize or hydrolyze readily. The data on volatilization is contradictory. The $\beta$-isomer is the most persistent of the technical BHC substances. (5)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other:

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: The dangerous acute dose of technical BHC is approximately 30g in humans. This estimate may be high. (6)

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action: Alpha ($\alpha$) and gamma ($\gamma$) isomers cause CNS stimulation, resulting in hyper-excitability and convulsions. The beta ($\beta$) and delta ($\delta$) isomers cause CNS depression. (7) Symptoms of HCH poisoning are often delayed up to 3 hours. They include convulsions, respitory difficulty and heart failure. HCH is highly toxic by ingestion, moderately by inhalation and dermal exposure. (5)

Causes taste problem in water at 20 ug/L. (5)

## ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticides  Lab Specialist: Manager  Phone: 248-3846

Others: Pesticide Residue Testing Lab, OMAF, U of Guelph

II Detection Limits

Water: 0.001 to 0.02 ug/L (8)  Biological: 0.001 to 0.02 ug/L (8)  Air:

Sediment: 0.001 to 0.02 ug/L (8)  Other:

## SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources:

Uses: The gamma ($\gamma$) -isomer (lindane) is the most insecticidally toxic ingredient in technical grade BHC. Therefore technical grade BHC has limited comercial use except as the raw material from which the $\gamma$-isomer is extracted by a process of selective crystallization. (1)

## OTHER INFORMATION

I Case Studies

## REFERENCES


1. United States Environmental Protection Agency. Ambient Water Quality Criteria for Hexachlorocyclohexane. Criteria and Standards Division. United States Environmental Protection Agency. Washington, D.C. 20460. 1980.
2. Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals. Van Nostrand Reinhold Company. Toronto. 1977.
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6. N. Irving Sax. Dangerous Properties of Industrial Materials. Fifth Edition. Van Narstrand Reinhold Company.
7. G. D. Clayton and F. E. Clayton, Eds. Patty's Industrial Hydgiene and Toxicology. Third edition. Volume 2B. John Wiley and Sons, New York.
8. Ontario Ministry of the Environment. Outlines of Analytical Methods. Coordinated by Water Quality Section. Labratory Services Branch. Ontario Ministry of the Environment. P.O. Box 213, Rexdale, Ont. 1981.
9. United States Department of the Interior Fish and Wildlife service. Handbook of Acute Toxicity of Chemicals to Fish and Aquatic Invertebrates. By W.W. Johnson and M.T. Finley. Resource Publication 137 Washington, D.C. 1980.

IDENTIFICATION

I Name Lindane

Chem. Symbol: $C_6 H_6 Cl_6$ CAS No.: 58-89-9 Date: May 2, 1985

Other Common Names: gamma BHC; γ-BHC; gamma Hexachlorocyclohexane; gamma HCH; γ-HCH; Gammexane; Gammopaz.

II Physical Chemical Properties

MP: 112.5°C (1) BP: 288°C (2) Solubility: 10 mg/L (1) 17.0 mg/L at 20°C (99% purity) (16) VP: 0.0008 mmHg (1) S.G.: 1.87 (2)

$BOD_5$:

III Appearance and other properties Lindane is the gamma (γ) stereoisomer of 1,2,3,4,5,6-Hexachlorocyclohexane (BHC). (1) The technical grade Lindane must not contain less than 99.5% of gamma isomer of BHC. The melting point should be between 112°C and 113°C and essentially it should be odour-free. (13)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 0.01 ug/L unfiltered (3) Others: 0.080 ug/L as a 24-hr avg. and never exceed 2.0 ug/L U.S. EPA (1)

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: 0.001 to 0.03 ppb in the Niagara R. (4)

Sediment: 20 ppb in the Niagara R. sediments. (5)

Biological Organisms: Fish from the Niagara R. (white bass, rock bass, white sucker) range from 0.02 to 0.08 ppm (6). Lindane has been detected in fish from the Great Lakes between 1 - 100 ppb, also detected in fish from other inland waters in the low ppb range. (15)

III Biological Information

Partition Coef.: 3.72 (7) Threshold Odour: Bioaccumulation Factor: Low. 21-486 in fish (2)

Half-Life - Water: see*below Sediment: see*below Fish:

Synergistic, Additive, Antagonistic Factors: Blue-green algae (25 species) antagonises the toxicity of Lindane (γ BHC) by lowering its concentration in the water column (8)

| Toxicity Testing: | Concentration | Species | Test Water | Results | |
|---|---|---|---|---|---|
| γ-BHC (Lindane) | 460 ug/L | Daphnia pulex | 15°C | 48-hr EC50 | (9) |
| γ-BHC (Lindane) | 27 ug/L | Rainbow trout | 12°C | 96-hr LC50 | (9) |
| γ-BHC (Lindane) | 1.7 ug/L | Brown trout | 13°C | 96-hr LC50 | (9) |
| γ-BHC (Lindane) | 87 ug/L | Fathead minnow | 18°C | 96-hr LC50 | (9) |

* Lindane is very stable in water and soil. Its half-life approaches the value for DDT (several years in soil and water). (2) Up to 90% of Lindane is biodegraded by anaerobe bacteria in 4 days and is transformed to chlorine-free metabolites. (16) See Other Information section.

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: 0.004 mg/L MAC (10) Other: 3ug/l WHO (17)

Fish Consumption: 0.3 ug/g administrative guideline of the U.S. Food and Drug Administration. (11)

Tolerance Limits in Other Foodstuffs: 3 ppm in fruits and vegetables; 2.0 ppm (calculated on the fat content) in meat, meat by-products and fat of cattle, goats, hogs and sheep; 0.7 ppm (calculated on the fat content) in meat, meat by-products of poultry; 0.2 ppm (calculated on the fat content) in dairy products. Canadian Dept. of National Health and Welfare. (12)

II Effects

Acute Toxicity: Oral LD50 88-125 mg/kg in male rats (13) Half-Life:
Dermal LD50 1000 mg/kg in male rats (13)

Mutagen: Teratogen: Carcinogen: positive animal

Mode of Toxic Action: Lindane is a CNS stimulant. (8)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticides Lab Specialist: Manager Phone: 248-3846

Others: Pesticide Residue Testing Lab OMAF U of Guelph.

II Detection Limits

Water: 0.001 to 0.02 ug/L (14) Biological: 0.001 to 0.02 ug/L (14) Air:

Sediment: 0.001 to 0.02 ug/L (14) Other:

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced: Consumed: Discharge: Air: Water: Land:

Other Sources:

Uses: Major use is seed treatments, other uses include soil treatment; foliage application on fruit trees, vegetables, ornamentals and wood protection. (13)

OTHER INFORMATION

I The calculated half-life in 1 m of water at 25°C is 4590 hrs. (based on an evaporation rate of $1.5 \times 10^{-4}$ m/hr). (16) 75-100% disappearence from soils: 3-10 years. (16)

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IDENTIFICATION

I Name Malathion

Chem. Symbol: $C_{10}H_{19}O_6PS_2$ CAS #: 121-75-5 Date: May 25, 1984

Other Common Names: O,O-dimethyl S-1,2-di(ethoxycarbonyl)ethyl phosphorodithioate; Carbofos; Chemathion Cythion; Emmaton; Emmatos; Emmatos Extra; For Mal; Fyfanon; Karbophos; Kop-Thion; Kypfos; Malamar; Malaspray, Malathion; Mercapothion; MLT; Zithol.

II Physical Chemical Properties

MP: 2.85°C (12) BP: 156-157°C at 7mmHg (12) Solubility: 150 mg/L (1) 145 mg/L at 20°C (12) VP: $4x10^{-5}$mmHg at 20°C S.G.: 1.2315 (12)

$BOD_5$:

III Appearance and other properties

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 0.1 ug/l unfiltered (2) Others: 0.1 ug/l U.S. EPA (1976) (1)

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: 11 Agricultural Watersheds tested in S. Ontario (May 1975 - April 1977), levels were ND in 99.6% of the samples and levels were 0.01 ng/L (average) from the remaining samples (3)

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: 2.89 (12) Threshold Odour: Bioaccumulation Factor:

Half-Life - Water: 5 mos. (pH6); 1-2 wks. (pH8) (4) Sediment: see * below Fish:

Synergistic, Additive, Antagonistic Factors: Aquatic invertebrates appear to be more sensitive than vertebrates. (4)

| Toxicity Testing: Concentration | Species | Test Water | Results |
|---|---|---|---|
| 12.5 mg/L | Fathead minnows | | 96-hr. TLm (5) |
| 25.0 mg/L | Fathead minnows | | 24-hr. TLm |
| 0.033 mg/L | Young Salmon | | 24-hr. TLm |
| 0.11 mg/L | Bluegill | | 96-hr. LC50 |
| 0.068 mg/L | Rainbow Trout | | 96-hr. LC50 |
| 0.001 mg/L | Water scud | | 96-hr. LC50 |

*75-100% disappearance from soils: 1 week. (12)

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: 100 ug/l MAC (HWC) (1) Other: 0.1 mg/l U.S. NAS/NAE (1)

Fish Consumption:

Tolerance Limits in Other Foodstuffs: Max. residue limits range between 0.5 to 8.0 ppm in most fruits and vegetables. (6)

II Effects

Acute Toxicity: 1375 mg/kg (LD50) in rats (oral) (7)
4100 mg/kg (LD50) in rabbits (dermal) (7) Half-Life:

Mutagen: negative salmonella (12) Teratogen: Carcinogen: negative (12)

Mode of Toxic Action: Strong inhibitor of acetylcholinesterase. (8)

Malathion has been fed to rats for 104 weeks at levels as high as 5,000 ppm in the diet with no gross effects. (8)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticide Section  Lab Specialist: G.A.V. Rees  Phone: 248-3846

Others:

II Detection Limits

Water: 0.01 to 0.10 ug/L (9)  Biological:

Sediment: 0.001 to 0.01 ug/g (9)  Other: vegetation 0.001 to 0.01 ug/g (9)

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources:

Uses: Malathion controls a wide variety of insects including aphids, spider mites, scale insects, house flies, and mosquitoes as well as a large number of other sucking and chewing insects attacking fruits, vegtables, ornamentals and stored products. Malathion's use is particularly indicated where a high degree of safety to mammals is desired. (7) Malathion is however extremely toxic to honeybees. (11)

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I Case Studies

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4) United States, Environmental Protection Agency, Washington, D.C. 20460. Quality Criteria for Water, July 1976.

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7) Farm Chemicals Handbook 1980. Meister Publishing Company, Willoughby, Ohio.

8) Hurtig, H. Long Distance Transport of Pesticides. Environmental Toxicology of Pesticides. Matsumura, F., Bousch, G.M., and Misato, M., Editors. Academic Press, New York and London, 1972.

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11) Canada National Research Council. Pesticide-Pollinator Interactions. Associate Committee on Scientific Criteria for Environmental Quality NRCC Publication 18471. Ottawa, Canada - 1981.

12) Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals.Second Edition Van Nostrand Reinhold Company. Toronto. 1983.

IDENTIFICATION

I Name Methoxychlor

Chem. Symbol: $C_{16}H_{15}Cl_3O_2$ CAS #: 72-43-5 Date: May 25, 1984

Other Common Names: 1,1,1-trichloro-2,2-bis (p-methoxyphenyl) ethane; dimethoxy-DT; DMDT; Marlate; methoxychlore; 100 mg/L methoxy-DDT; metossichloro; Moxie. Marlate is the registered trade name of DuPont of Canada, Limited (1, 5)

II Physical Chemical Properties

MP: 89°C (2) BP: Solubility: 0.04mg/L at 24°C (99% purity) (2) VP: Low S.G.: 1.41

$BOD_5$:

III Appearance and other properties White crystalline. Organochlorine Insecticide. The technical product contains 88% of the p,p'-isomer, the bulk of the remainder is the o,p-isomer. (2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 0.04 ug/l unfiltered (3) Others: 0.03 ug/l U.S. EPA 1976 (4)

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: None detected (0.01 ug/l detection limit) in Lakes Erie and Ontario. (5)

Sediment: None detected (0.01 ug/kg detection limit) in Lakes Erie and Ontario (5)

Biological Organisms: Lake Ontario phytoplankton - 23 to 71 ug/kg (5)

III Biological Information

Partition Coef.: Threshold Odour: 4.7ppm (2) Bioaccumulation Factor: 300-1500 (6)

Half-Life - Water: Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results | |
|---|---|---|---|---|
| 0.25 mg/L | Bluegill Fingerling | - | a few survived | (7) |
| 0.03 mg/L | Bluegill Fingerling | - | toxicity threshold | |
| 0.056 mg/L | Goldfish | - | 96-hr TLm | |
| 0.125 mg/L | Goldfish | soft water pH7 | 90% died | |
| 0.2 mg/L | Large Bluegills | outdoor ponds | all died | |

Methoxychlor is an excellent replacement for DDT where application may constitute a hazard to warm-blooded animals or susceptible plants. It is rarely phytotoxic and injury is usually negligible. (8) Methoxychlor does not appear to biomagnify through the food chain but its bioaccumulation in phytoplankton may be critical.

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: 0.1 mg/L (12) (4) Other: U.S. EPA 0.1 mg/L (4)

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: 6000 mg/kg (LD50) in rats (oral) (8) Half-Life:

Mutagen: Teratogen: suspected (9) Carcinogen: negative (9)

Mode of Toxic Action: Methoxychlor impairs normal functioning of the nervous system. (5)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticide Section  Lab Specialist: G.A.V. Rees  Phone: 248-3031

Others:

II Detection Limits

Water: 0.001 to 0.02 ug/L (10) Biological: 0.001 to 0.02 ug/g (10) Air:

Sediment: 0.001 to 0.02 ug/g (10) Other: vegetation 0.001 to 0.02 ug/g (10)

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced: Consumed: Discharge: Air: Water: Land: 1,030 kg (1978) (11)

Other Sources:

Uses: Widely used because of its long residual action against many species of insects and its low toxicity to humans and warm blooded animals. For control of insect pests on fruit trees, dairy and beef cattle, home gardens, and around farm buildings (except poultry houses). (8).

OTHER INFORMATION

I Case Studies

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IDENTIFICATION

I Name Pyrethrum

Chem. Symbol: CAS #: Date: October 14, 1981

Other Common Names:

II Physical Chemical Properties

MP: BP: Solubility: VP: S.G.:

$BOD_5$:

III Appearance and other properties Belongs to the group known as botanical insecticides. The active ingredients in the pyrethrum insecticides are various pyrethrins and cinerins. (1)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: unfiltered water: not exceed 0.006 ug/L (2) Others: U.S. NAS/NAE 0.002 ug/L (3)

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: Threshold Odour: Bioaccumulation Factor:

Half-Life - Water: less than 48 hours (1) Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

Toxicity Testing:

| Concentration | Species | Test Water | Remarks |
|---|---|---|---|
| 78 ug/L | Bluegill | | 24-hr. LC50 (4) |
| 70 ug/L | Bluegill | | 96-hr. LC50 |
| 56 ug/L | Rainbow Trout | | 24-hr. LC50 |
| 54 ug/L | Rainbow Trout | | 96-hr. LC50 |

Fish are more sensitive to Pyrethrum in a emulsifiable formulation.

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other:

Fish Consumption:

Tolerance Limits in Other Foodstuffs: 3 ppm max. acceptable residue in raw cereals. (5)

II Effects

Acute Toxicity: 18,000 mg/kg (LD50) in rat (dermal) (6) Half-Life:
15,000 mg/kg (LD50) in rate (oral) (6)
≈ 14,000 mg/kg (LD50) in man (oral) (1)

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action: Pyrethrum in an insecticide spray does not remain toxic after 48 hrs. (1)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticide Section  Lab Specialist: G.A.V. Rees  Phone: 248-3846

Others:

II Detection Limits

Water:  Biological:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources:

Uses: Pyrethrum extracts are used in stock sprays, pet sprays, household sprays and aerosols, industrial sanitation sprays and to protect stored food in warehouses, etc.

OTHER INFORMATION

I Case Studies

REFERENCES

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6) Farm Chemicals Handbook 1980. Meister Publishing Company, Willoughby, Ohio.

IDENTIFICATION

I Name Simazine

Chem. Symbol: $C_7H_2ClN_5$ CAS #: 122-34-9 Date: May 25, 1984

Other Common Names: 2-chloro-4,6-bis (ethylamino)-5-triazine; Amizine; COT; CET; Gesapum; Gesatop; Primatols; Princep; Simanex (1)

II Physical Chemical Properties

MP: 225-227°C (2) BP: Solubility: 3.5 ppm at 20°C (2) VP: S.G.:
5 ppm at 20°C (7)

$BOD_5$:

III Appearance and other properties Crystalline substance belonging to the group of herbicides known as Triazine compounds. (2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 10 ug/l unfiltered (3) Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water: 11 Agricultural Watersheds were tested in S.W. Ontario in 1977. Simazine was ND in 90.9% of the samples and had an average concentration of 0.04 ug/L in the remaining samples. (4)

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: Threshold Odour: Bioaccumulation Factor:

Half-Life - Water: Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

| Toxicity Testing: Concentration | Species | Test Water | Results |
|---|---|---|---|
| 6.6 ppm | Chinook Salmon | 20°C | 48 hr. TLm (5) |
| 130 ppm | Bluegill Sunfish | | 48 hr. LC50 (7) |
| 85 ppm | Rainbow Trout | | 48 hr. LC50 (7) |

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: Other: Health and Welfare Canada: 100 ug/l MAC(HWC)1969. (1)

Fish Consumption:

Tolerance Limits in Other Foodstuffs:

II Effects

Acute Toxicity: 10,000 mg/kg (LD50) in rats (oral) (2) Half-Life:
31,000 mg/kg (LD50) in rabbits (dermal) (2)

Mutagen: Teratogen: Carcinogen:

Mode of Toxic Action:

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticides Lab  Lab Specialist: G.A.V. Rees  Phone: 248-3846

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land: 8260 kg (1978) (6)

Other Sources:

Uses: Used for control of most annual grasses and broadleaf weeds in corn, established alfalfa, cherries peaches, cranberries, grapes, apples, pears, certain nuts, asparagus, certain ornamental and tree tree nursery stock and in turf grass sod production. At higher rates, it is used for non-selective weed control in industrial areas. (2)

OTHER INFORMATION

I Case Studies

REFERENCES

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IDENTIFICATION

I Name Toxaphene

Chem. Symbol: see Other Information Section CAS No.: 8001-35-2 Date: May 28, 1984

Other Common Names: Chlorinated Camphene; Camphechlor

II Physical Chemical Properties

MP: 70-95°C (1) BP: decomposition at 120°C (1) Solubility: 0.5 ppm to 3 ppm at 25°C (1) VP: 0.2 to 0.4 mmHg at 25°C (1) S.G.:

$BOD_5$:

III Appearance and other properties Toxaphene is a organochlorine insecticided composed of a chlorinated camphene mixture containing 67-69% chlorine. It is a yellow waxy solid with a mild terpene odour. (2)

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AQUATIC EFFECTS

I Objectives, Guidelines

Water PWQO: 0.008 ug/L unfiltered (3) Others:

Whole Fish (for the protection of fish eating birds):

Sediments:

II Ambient Concentrations in Ontario

Water:

Sediment:

Biological Organisms:

III Biological Information

Partition Coef.: 3.3±0.4 (1) Threshold Odour: 0.14ppm (detection) (11) Bioaccumulation Factor: 5,000-21,000 BCF in brook trout. (4) 1,000-2,000 BCF in aquatic invertebrates. (4) See * below

Half-Life - Water: Sediment: Fish:

Synergistic, Additive, Antagonistic Factors:

Toxicity Testing:

| Concentration | Species | Test Water | Results |
|---|---|---|---|
| 10 ug/L | Daphnia magna | 21°C | 48hr - EC50 (5) |
| 14.2 ug/L | Daphnia pulex | 15°C | 48hr - EC50 (5) |
| 10.6 ug/L | Rainbow trout | 12°C | 96hr - LC50 (5) |
| 18 ug/L | Fathead minnow | 20°C | 96hr - LC50 (5) |
| 2.0 ug/L | Largemouth bass | 18°C | 96hr - LC50 (5) |

* Toxaphene does not bioaccumulate in fish-eating birds. (2)
Adverse effects in fish attributed to toxaphene are stunted growth and skeletal fragility ("broken back syndrome")

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HUMAN AND MAMMALIAN EFFECTS

I Objectives, Criteria, Guidelines

Drinking Water: M.O.E.: 0.005 mg/l (9) Other:

Fish Consumption: 5.0 ppm U.S. Food and Drug Administration (10)

Tolerance Limits in Other Foodstuffs: Health and Welfare Canada limits toxaphene to 7ppm in most fruits and vegetables; 7ppm (calculated on fat content) in meat and meat-by products, and fat of cattle, goats, hogs, and sheep; 3-5 ppm on grains and rice; 0.1 ppm (calculated on fat content) in dairy products and poultry flesh and poultry by-products. (8)

II Effects

Acute Toxicity: Oral LD50 40-150 mg/kg in rats (2)
Oral LD50 25 mg/kg in rabbits (2)
Oral LD50 60 mg/kg in man (estimated) (2)

Half-Life:

Mutagen: insufficient information (6) Teratogen: insufficient information (6) Carcinogen: Animal positive (6)

Mode of Toxic Action:

Exposure of three groups of humans to toxaphene, via inhalation (2 groups) and dermal application (1 group), produced no evidence of toxic effects. (2)

ENVIRONMENTAL DETECTION

I Analytical Source

M.O.E. Lab.: Pesticides  Lab Specialist: Manager  Phone: 248-3846

Others:

II Detection Limits

Water:  Biological:  Air:

Sediment:  Other:

SOURCES AND USES

I Industrial and Commerical Sources

Amt. Produced:  Consumed:  Discharge: Air:  Water:  Land:

Other Sources: The primary source of toxaphene into waterbodies is in sediment transported by surface water run-off from areas of toxaphene use. (2) Because of its restricted use in Canada, run-off would not be an important source of toxaphene in Ontario's surface waters.

Uses: Toxaphene is registered by Agriculture Canada for the control of hornflies and ticks on beef cattle, sheep ked on sheep and ticks on horses. Toxaphene is also used in a mixture with lindane for the control of sarcoptic mites on hogs. It has been under restricted use in Ontario since 1973. In the U.S. toxaphene was used as a herbicide in soyabean crops and as a insecticide on cotton crops until its recent restriction in 1982. (2)

OTHER INFORMATION

Toxaphene is a complex mixture of chlorinated camphenes in which at least 117 compounds have been shown to exist. There is no single chemical formula that can accurately describe the chemical structure of toxaphene. An average formula for toxaphene is $C_{10}H_{10}Cl_8$. (3)

It should be noted that as a mixture of varying chlorinated structures, all toxaphene components do not have similar properties that provide parallel or similar environmental fates and toxicity. (3)

REFERENCES


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